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(56) Documents Cited
WO 86/03130 A1 US 5167421 A US 4703827 A

(58) Field of Search
UK CL (Edition O) B7B BSB
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(54) Vehicle safety system including a seat and seat mounting which absorbs shocks from front, rear or side impact

(57) The system includes a seat which is mounted by a pivot 5 and an angular guide 6 so that it can drop downwardly in a collision. Submarining of the occupant is prevented by a base spine restraint 10 and an opposite shoulder strap (9, fig.2) in addition to the usual seat belt. The seat also has deployable head-rests 1 and an emergency detachment mechanism. The seat support element 4 can move longitudinally on rails on an inner frame member 12 which can itself move laterally on an outer frame member 13. These movements are damped in a collision by shock absorbers 15, 16, 17 which have hollow rubber bodies 15 and air passages. The safety system also includes a cable 25 connecting the seat mechanism to a latch which allows the steering wheel to retract in a collision. The dashboard (30, fig.13) on the driver's and front passenger's side is rotatable about a transverse axis to reveal knee-pads (29, fig.13) on its underside. The occupants' legs are guided towards the knee pads (29) by leg guides (31, fig.13). The air-bag 27 is transparent so that the driver's view is not obstructed.

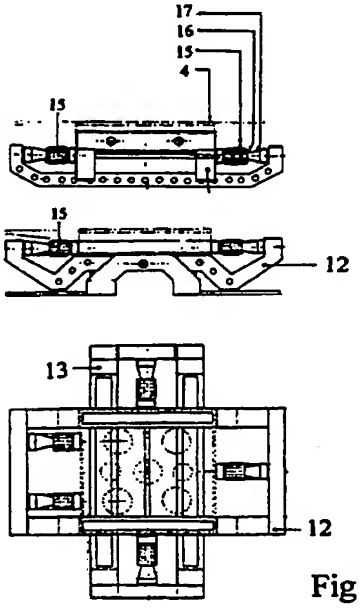

Fig 6

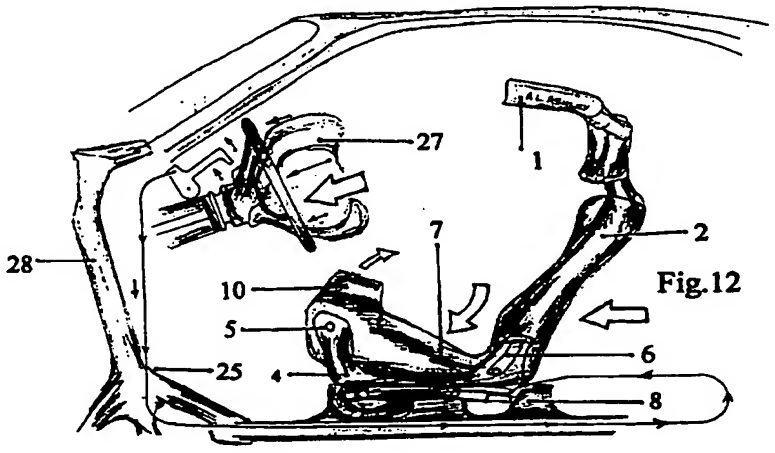

Fig.12

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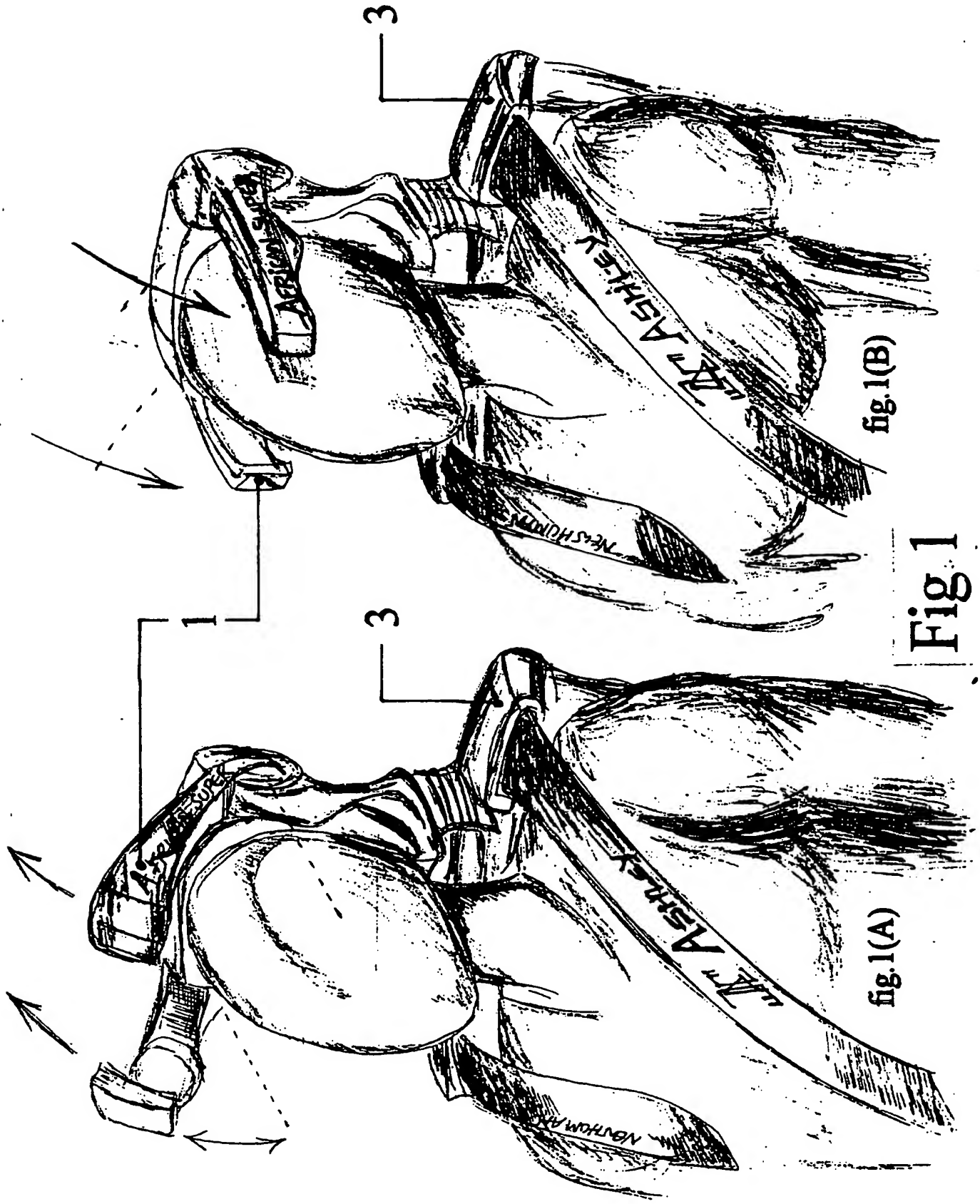


Fig 1

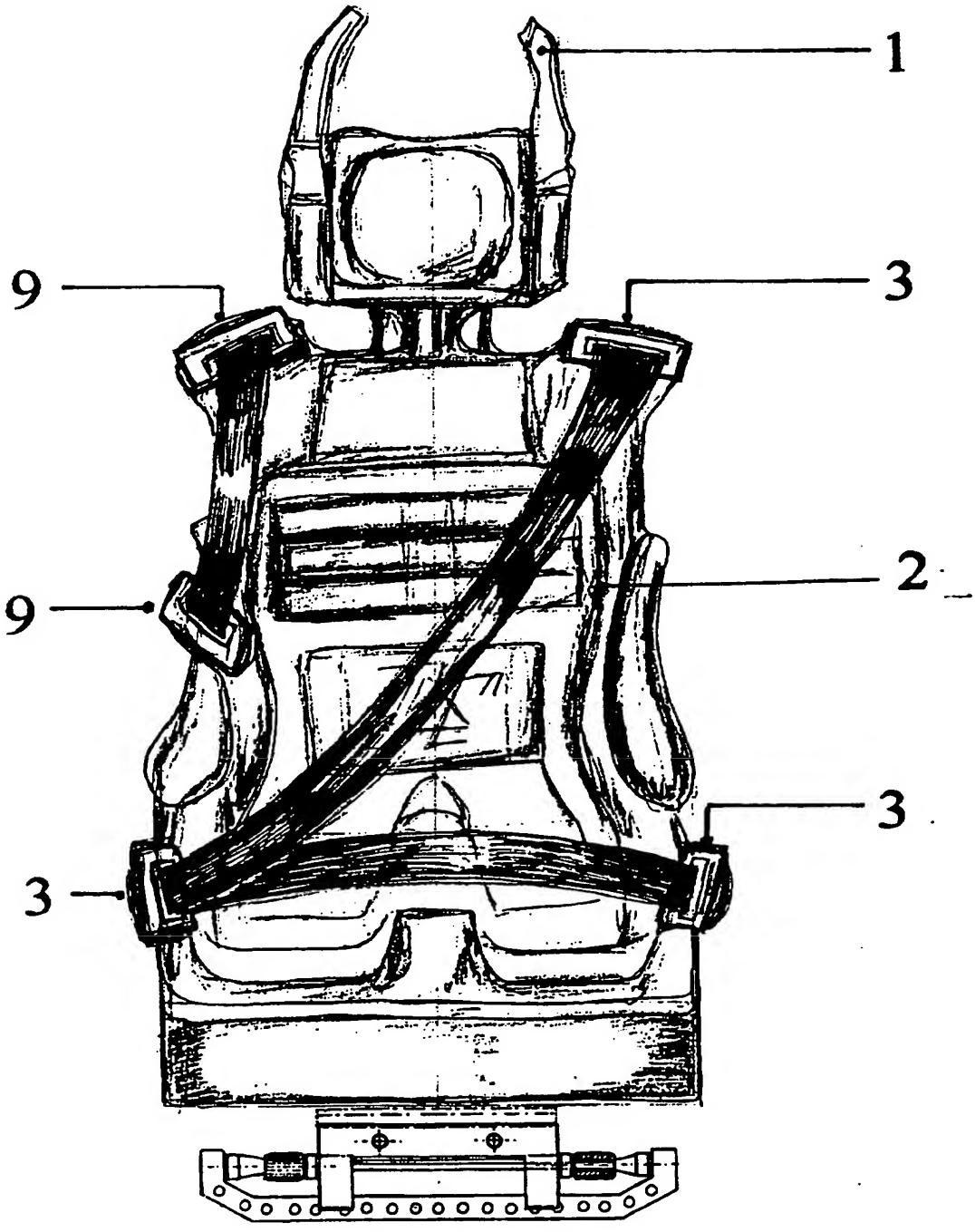


Fig.2

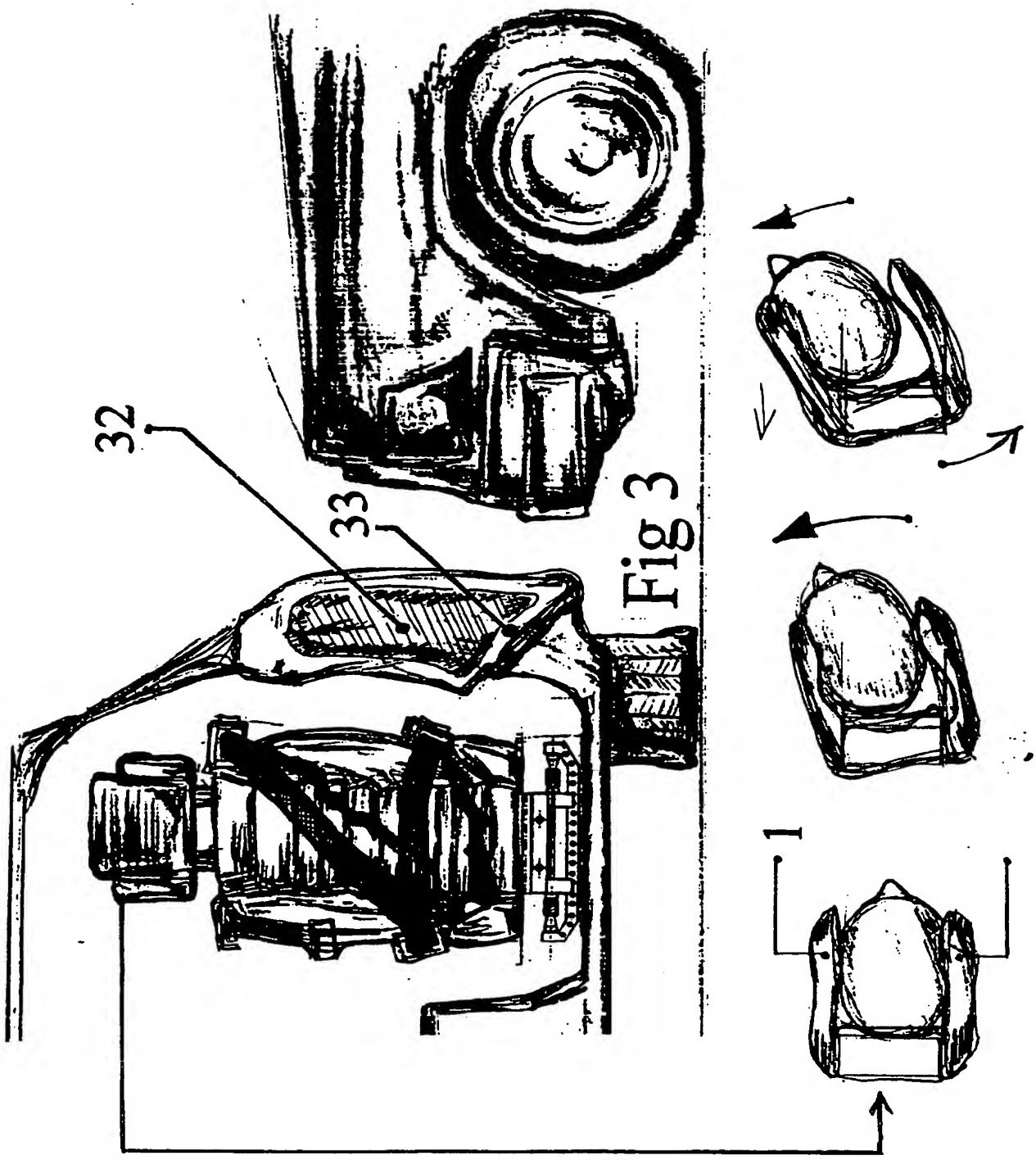


Fig 3

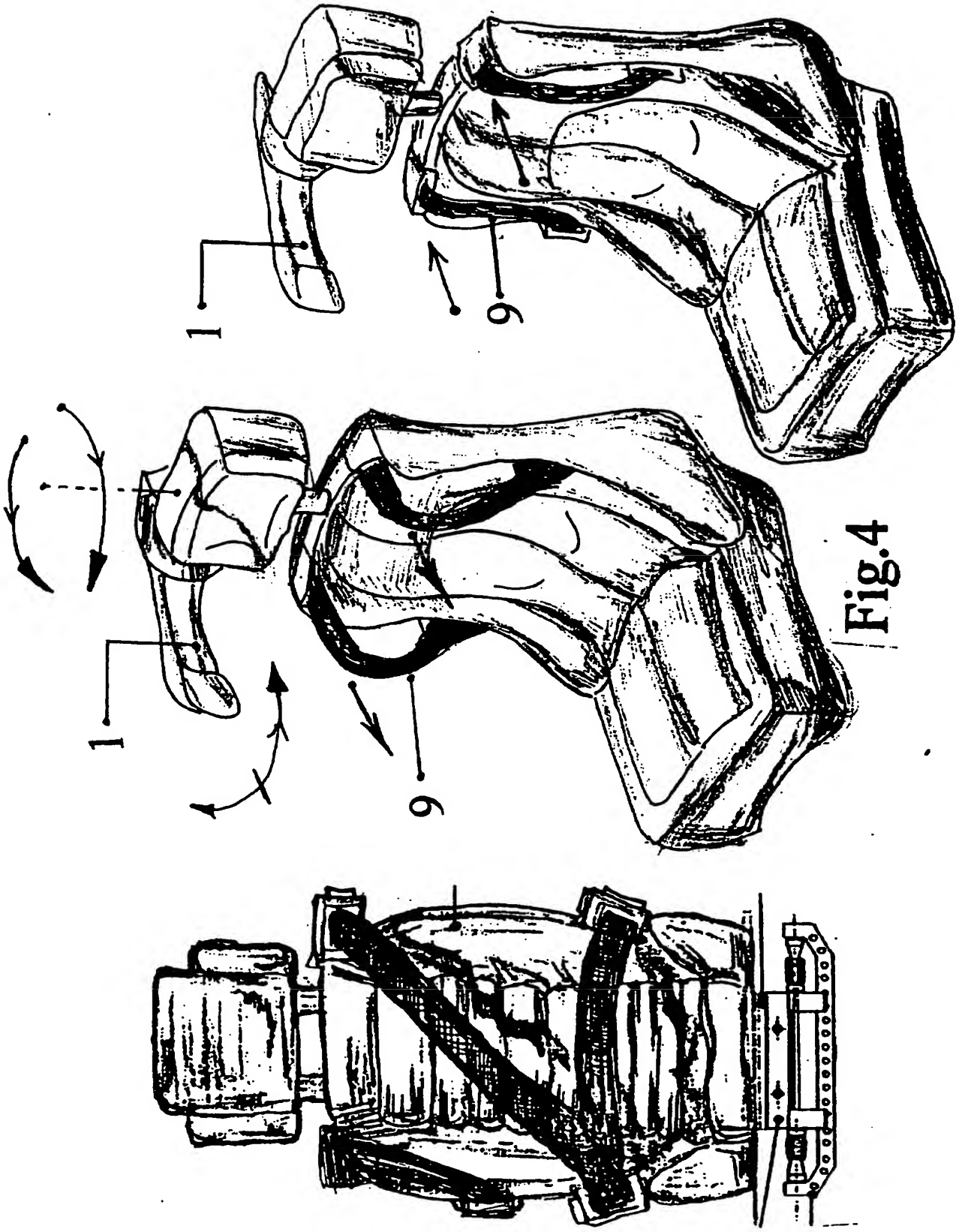


Fig.4

fig.5A

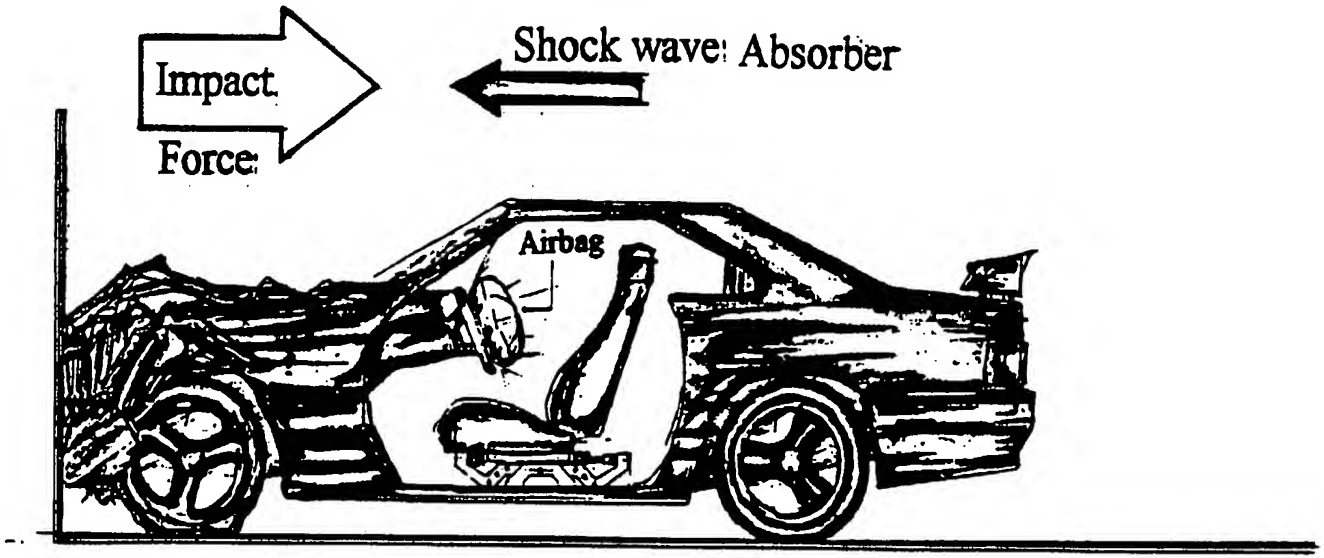
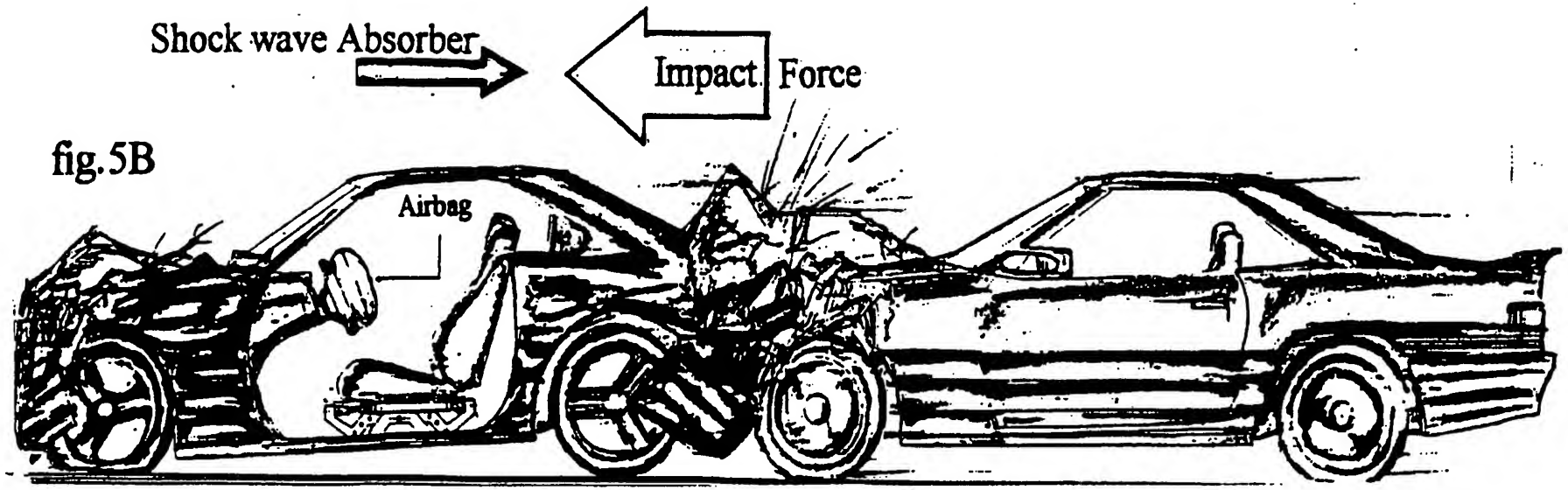


Fig 5

fig.5B



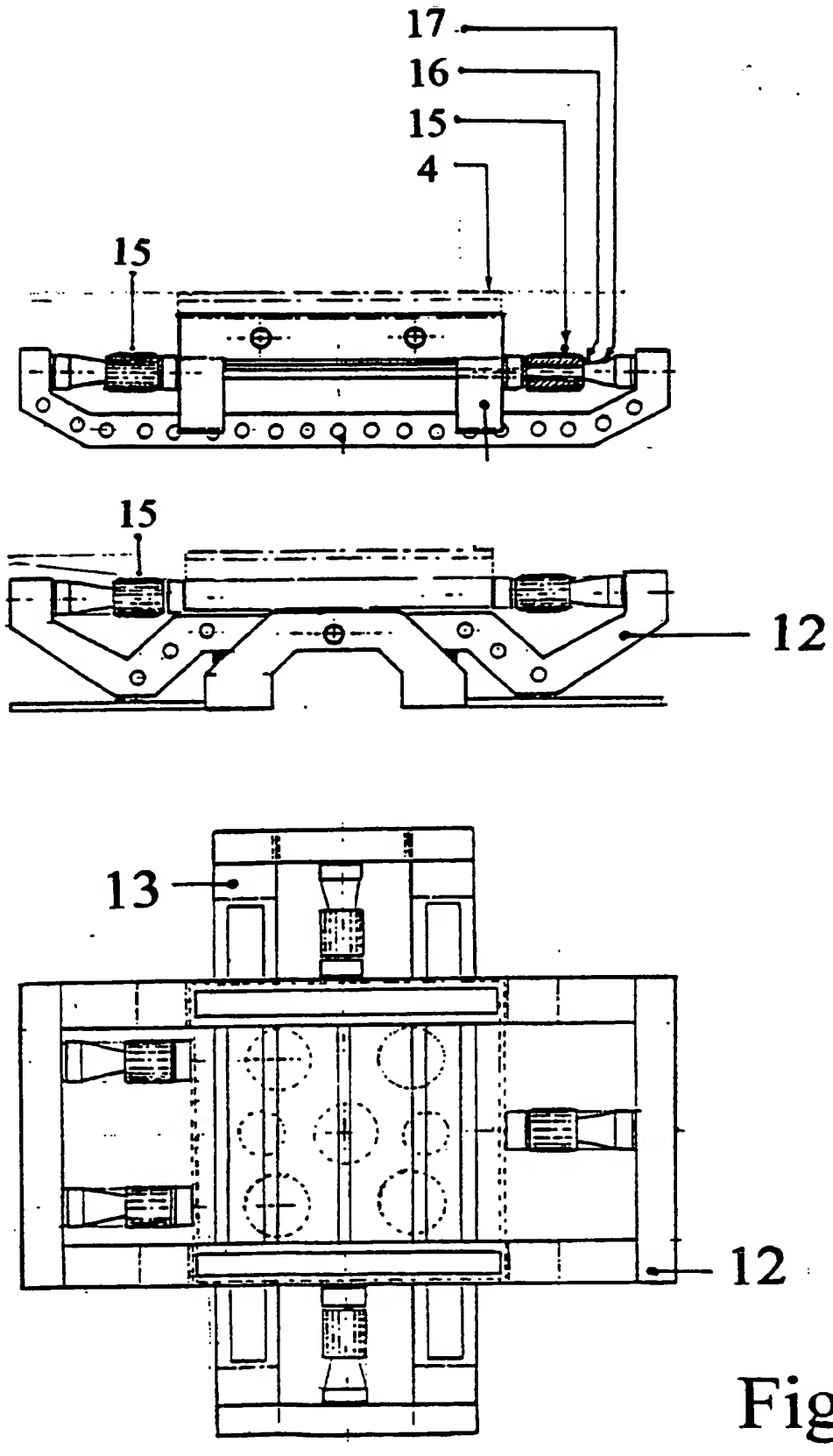


Fig 6

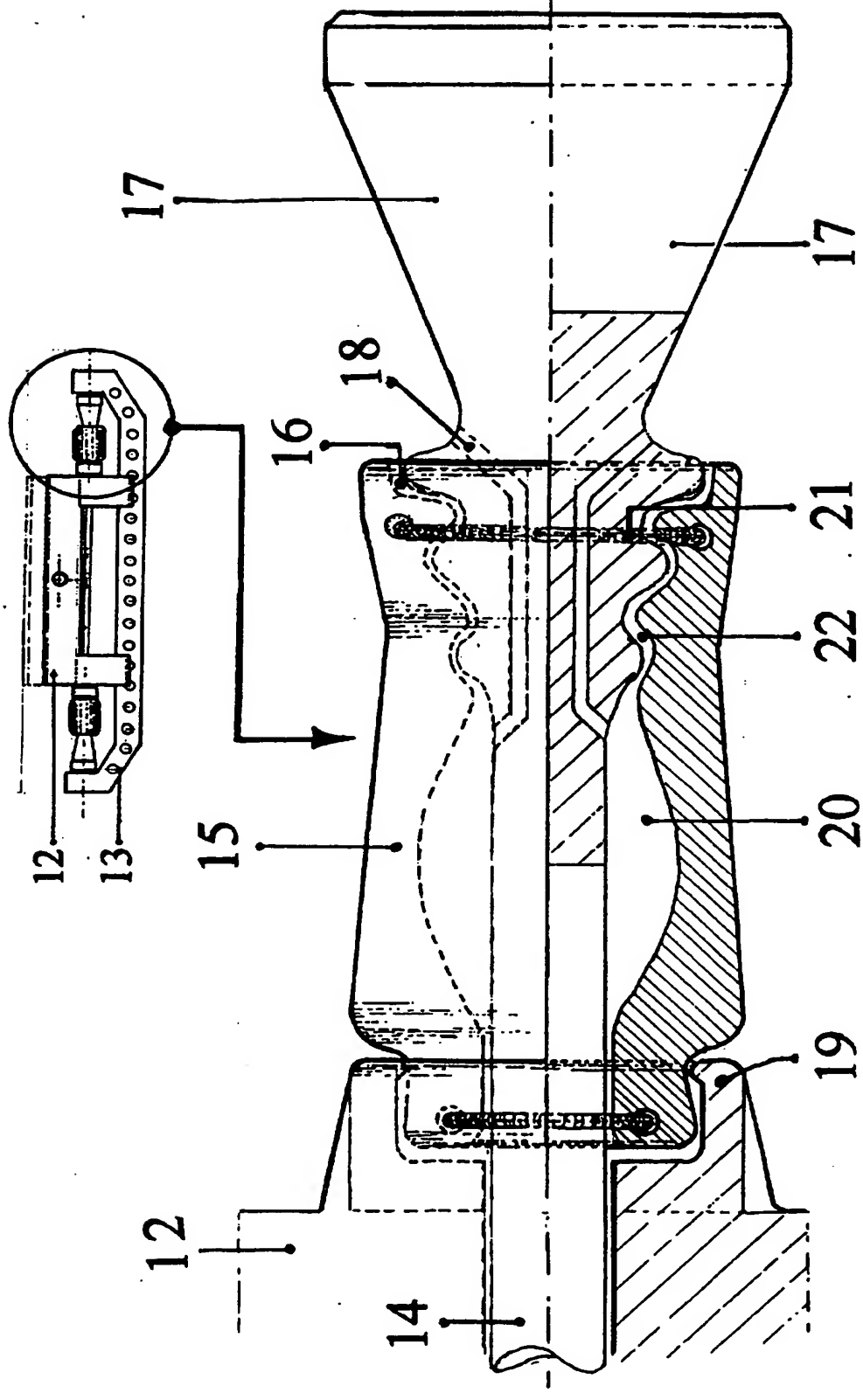


Fig7

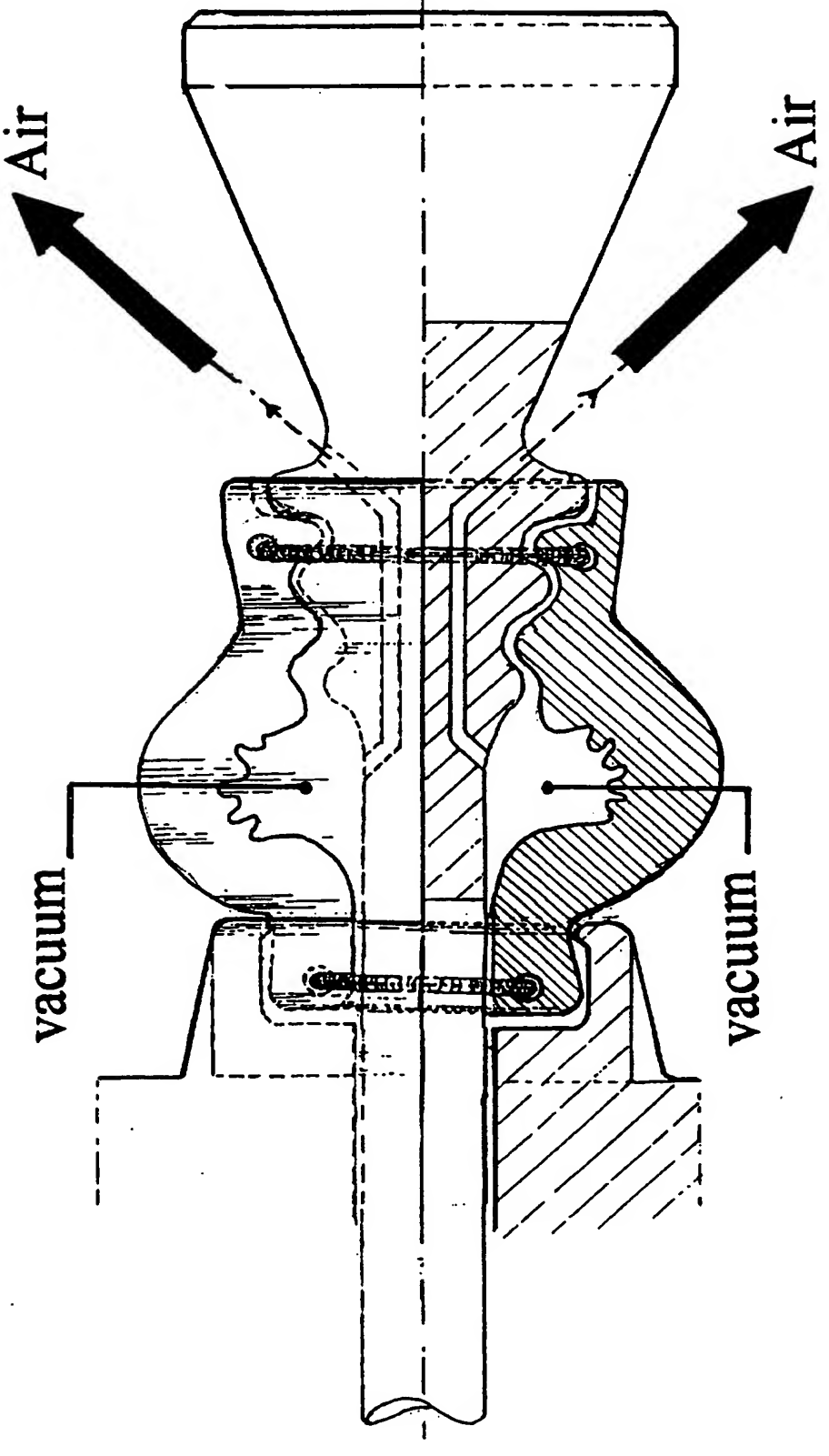


Fig8

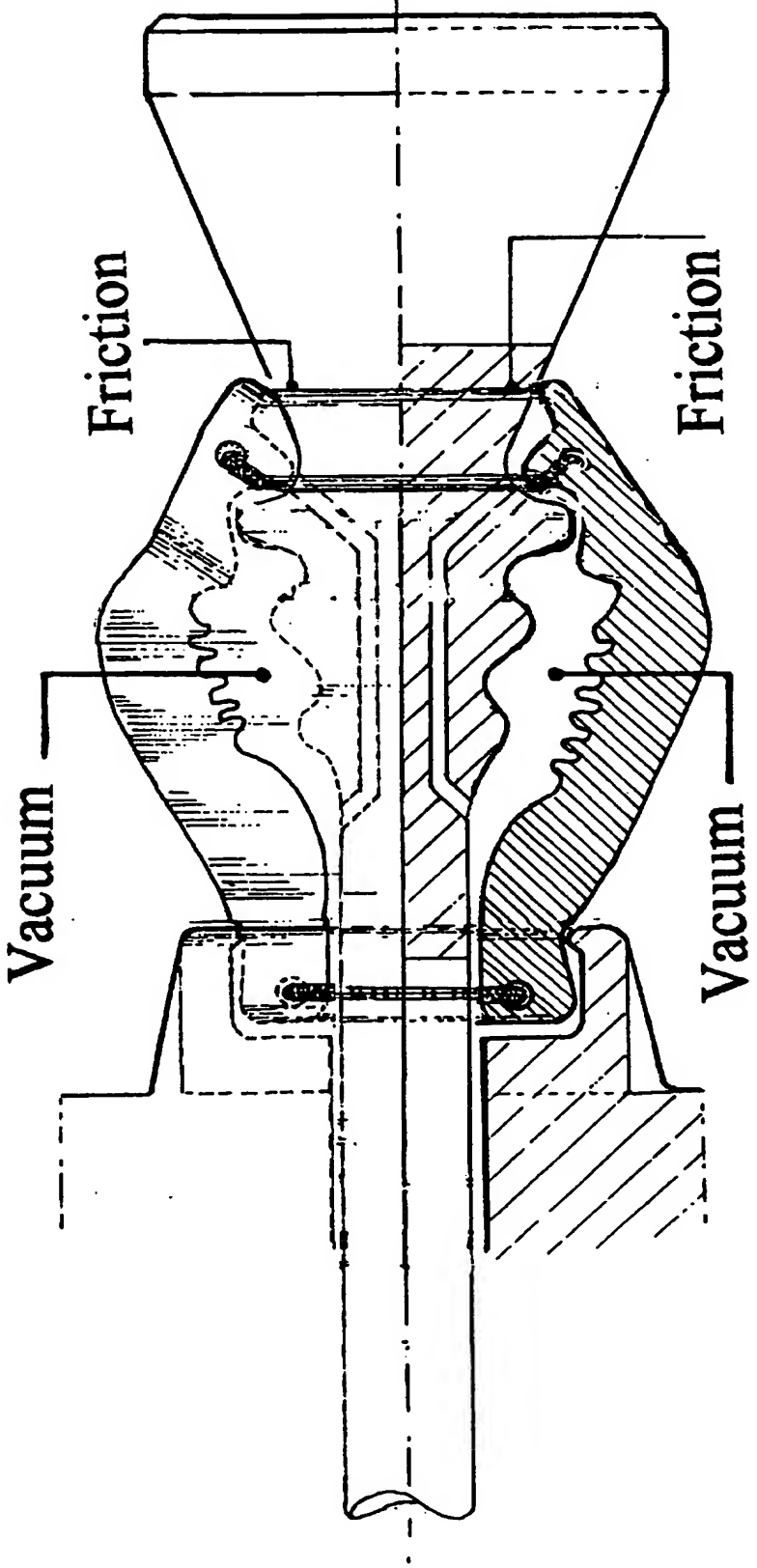


Fig9

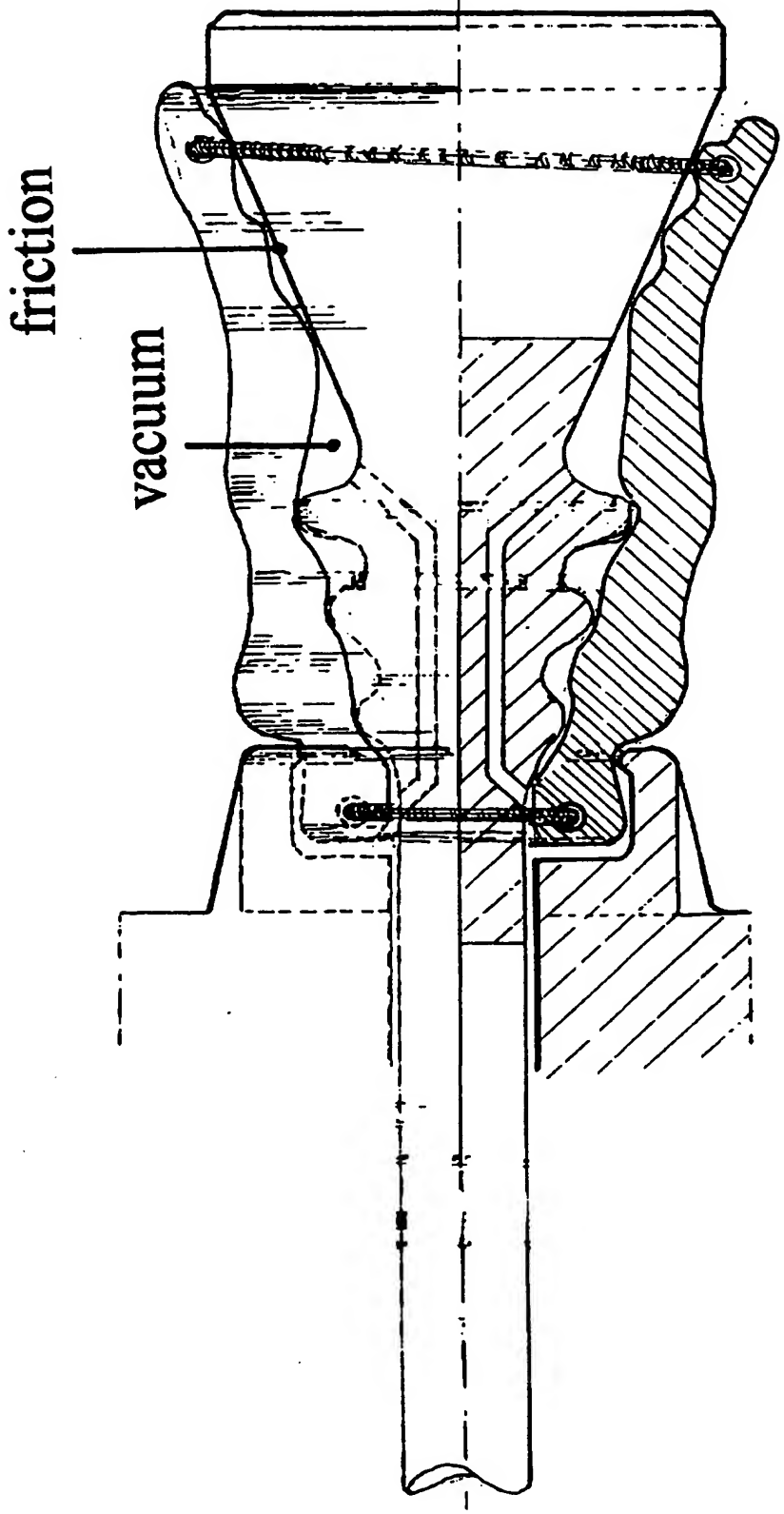


Fig10

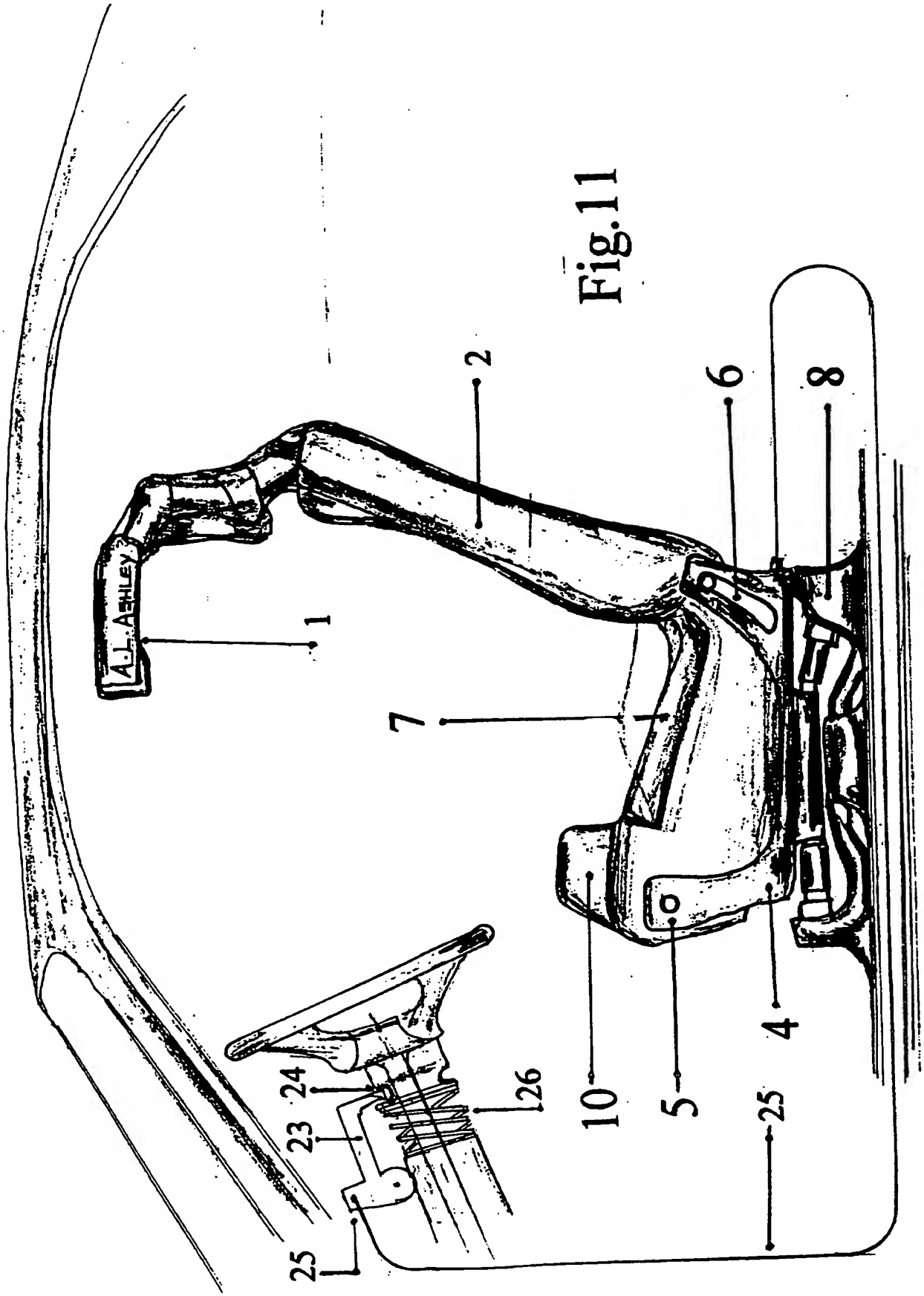
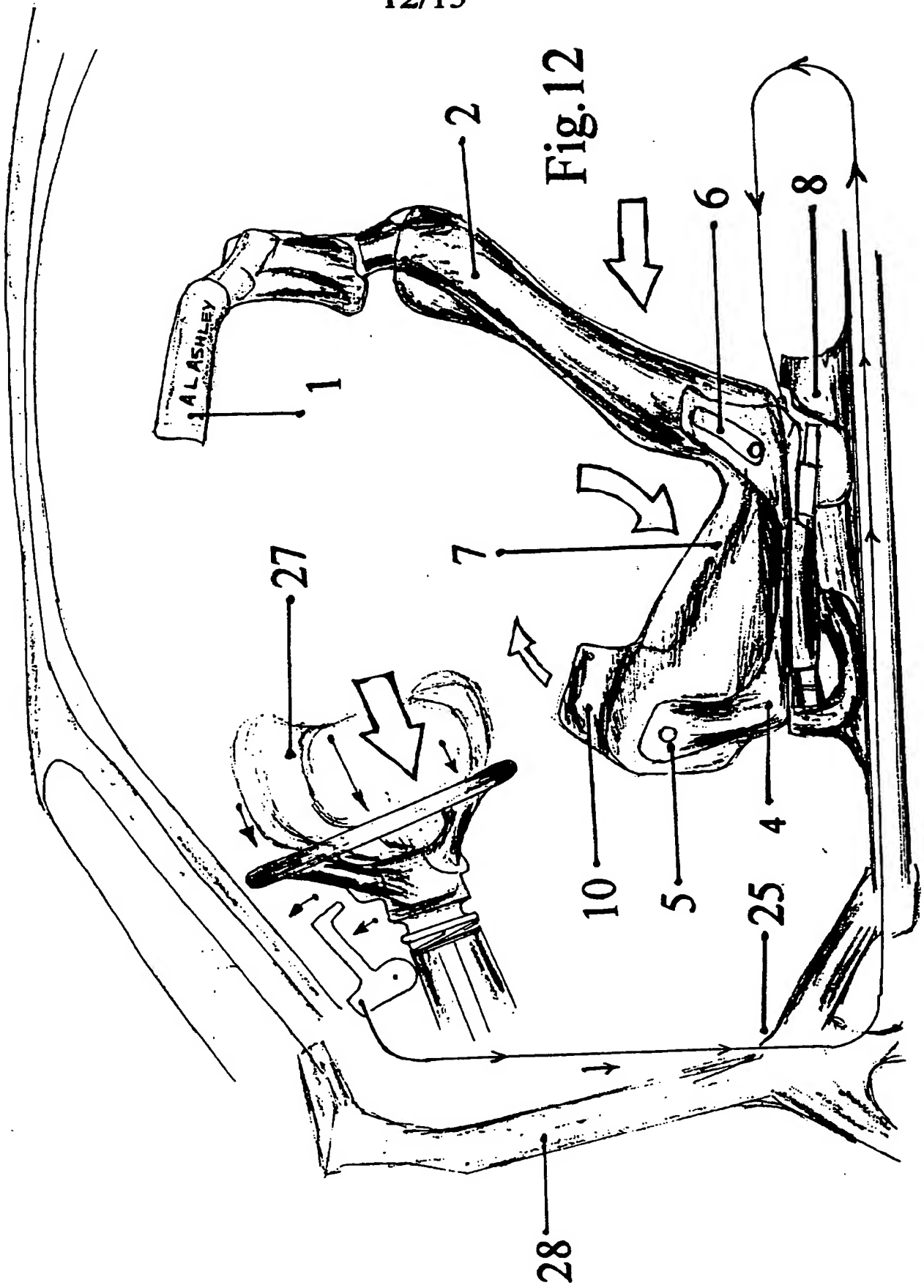


Fig.11

Fig.12



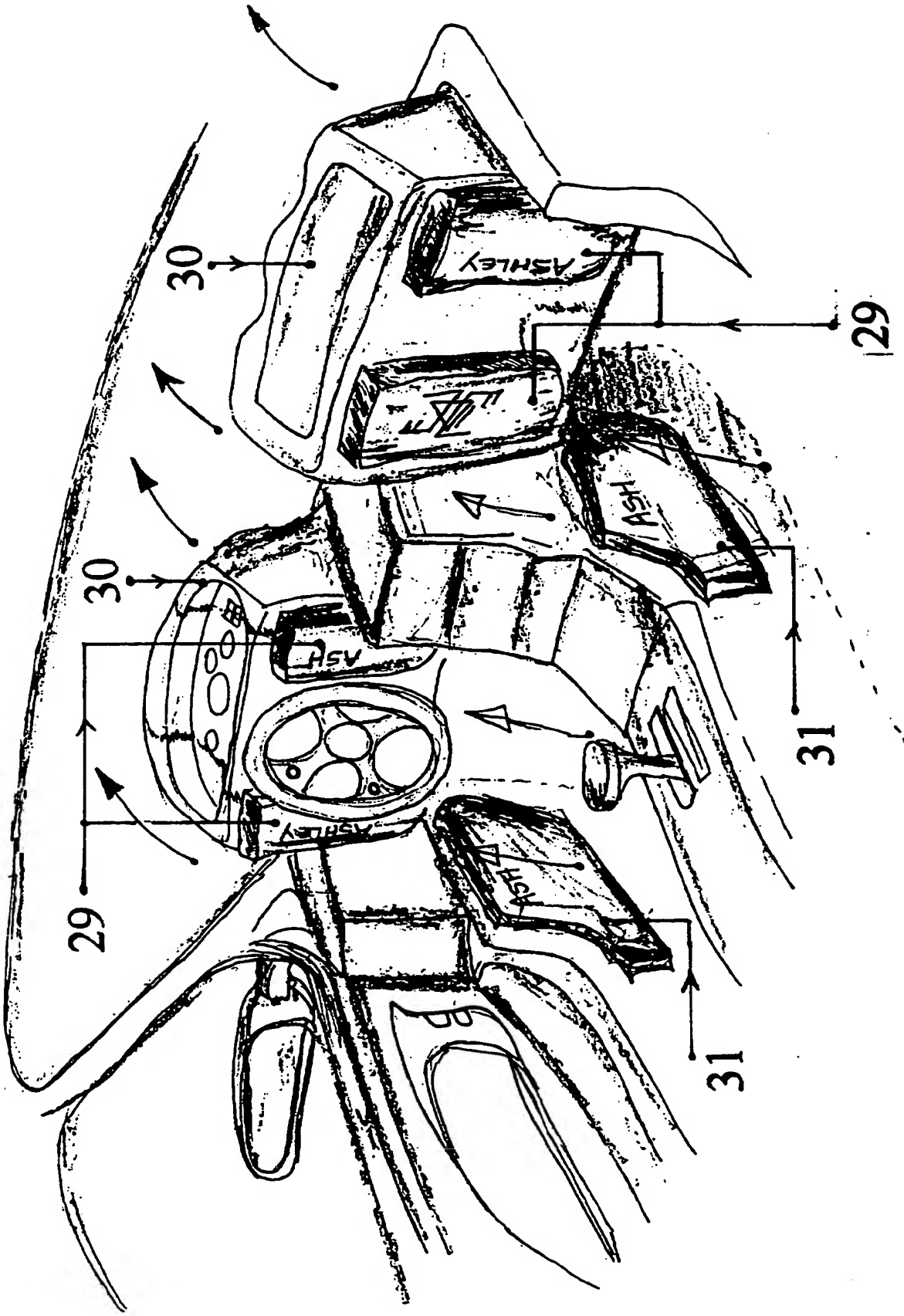


Fig.13

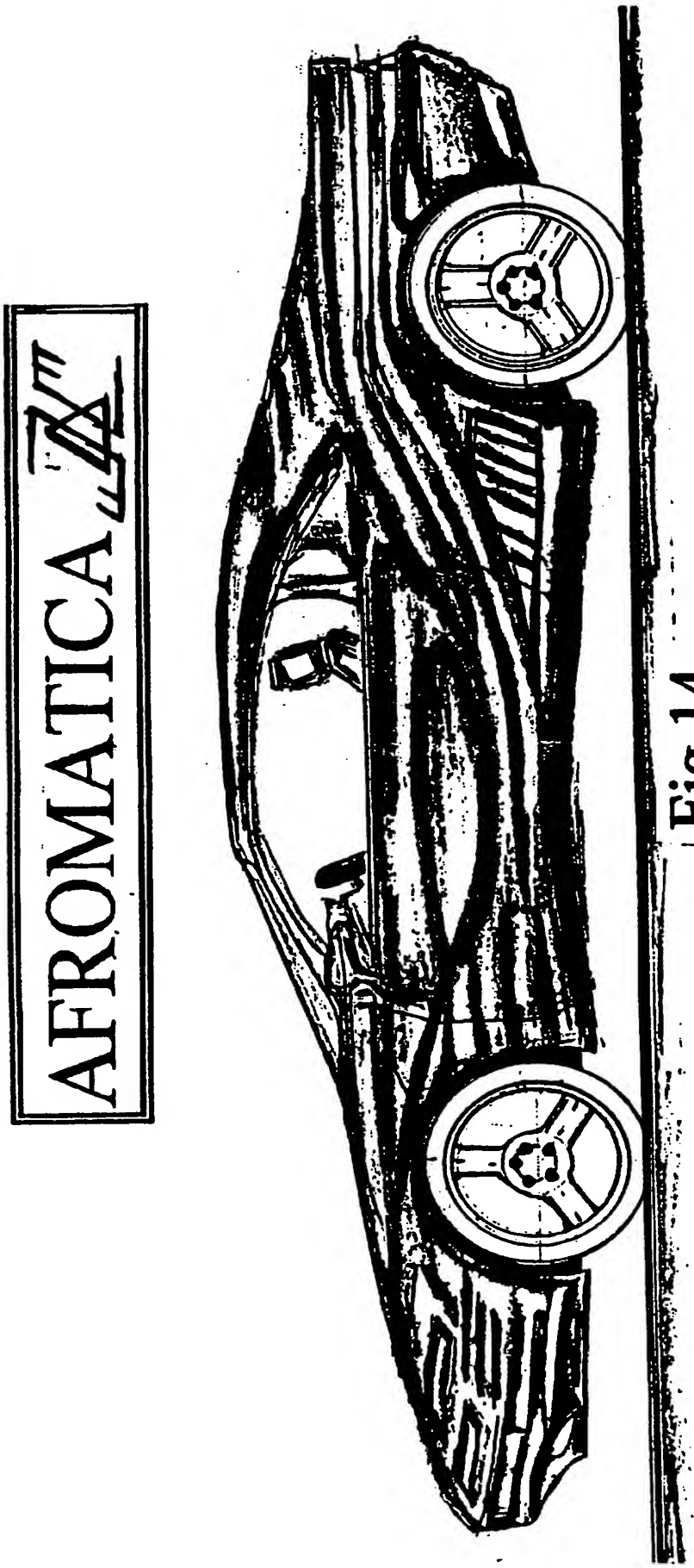


Fig.14

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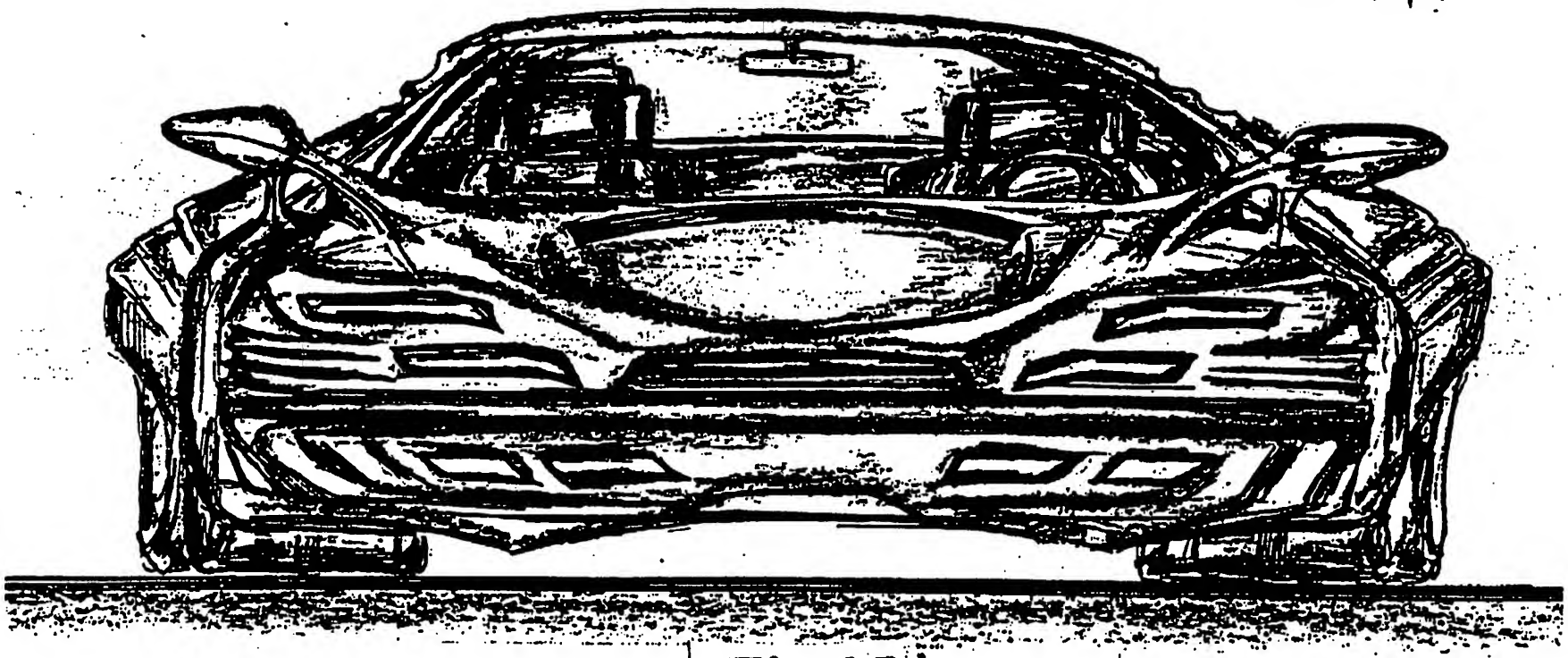

Fig.15

2300391

LISA

TECHNICAL FIELD OF THE INVENTION

This invention relates to an lateral impact shock wave absorber(LISA) a mechanism to improve vehicle safety by reducing the force of impact within a vehicle seat assembly and more particularly to a vehicle seat attachment and support mechanism for a vehicle seat assembly that dissipates and absorbs the impact shock energy on the human body, caused by an initial front ,rear or either side impact shock wave

BACKGROUND OF THE INVENTION

In conventional cars the car seat belt is bolted directly to the vehicle chassis (car body) floor pan. In the event of an accident the initial impact shock wave is transmitted across the vehicle chassis and up the vehicle seat via the seat bolts and across the seat belt which is also bolted to the vehicle chassis, this initial shock wave although it may last only a few micro seconds or milliseconds may cause internal organs to tear which causes internal bleeding, spinal damage which causes paralysis or brain damage which may lead to a coma memory loss or death, LISA will reduce this initial impact shock wave and therefore reduces injuries received by the driver and passengers.

SUMMARY OF THE INVENTION

According to the present invention there is provided an Lateral Impact Shock Wave Absorber(LISA) comprising:

an occupant seat assembly ,
a two degrees of freedom rigid frame assembly ,a deformation member mechanism assembly, a steering wheel impact retractor mechanism assembly, an impact dissipation mechanism assembly,

said occupant seat assembly comprising:
a head-rest support elements (HSE)(1) ,an ergonomic seat(ES)(2), a seat belt(SB)(3), at least one ergonomic seat support element(ESSE)(4), at least one ergonomic seat pivot(ESP)(5), at least one ergonomic seat angular guide(ESAG)(6), a concussion seat pad(CSP)(7), a base support member(BSM)(8), an opposite shoulder strap(OSS)(9), a base spine restraint(BSR)(10), an emergency detachment mechanism(EDM)(11),

means for releasably securing the ergonomic seat(ES)(2) on the ergonomic seat support element(ESSE)(4) is provided by the emergency detachment mechanism (EDM)(11) the ergonomic seat support element(ESSE)(4) being adapted to slide forwardly and backwardly on the inner rigid frame members(IRFM)(12) , the ergonomic seat support element(ESSE)(4) being impeded from free lateral movement by the adjacent said lateral impact shock absorbing mechanism assembly adjacent to the said inner rigid frame members(IRFM)(12),either side and towards the lower frontage of the ergonomic seat is pivotally attached to the either side and towards the upper frontage of the ergonomic seat support element(ESSE)(4) by means of the ergonomic seat pivot(ESP)(5) linkage which operate in co-operation with the seat angular guide(SAG)(6) mounted either side and towards the lower rear of the ergonomic seat(2) and the base support member(BSM)(8),

means for supporting the ergonomic seat(ES)(2) upright is provided by the base support member(BSM)(8) while the ergonomic seat(ES)(2) is in the neutral central position ,

means for angularly dropping the ergonomic seat(ES)(2) downwardly is provided by the co-operation of the ergonomic seat support element(ESSE)(2), the ergonomic seat pivot(ESP)(5) ,the seat angular guide(SAG)(6) and the said lateral impact shock absorbing mechanism assembly the angularly dropping mechanism is dependant upon the initial shock wave and the movement of the occupant moving against the seat belt(SB)(3) and additional opposite shoulder strap(OSS)(9) mounted on the ergonomic seat(ES)(2),

means for arresting the movement of the occupant from sliding under the seat belt(SB)(3) and sliding of the front of the seat is provided by the opposite shoulder strap(OSS)(9) and the base spine restraint(BSR)(10) mounted on the front seat area on the ergonomic seat(ES)(2) which would be located between the crotch of an occupant,

said two degrees of freedom rigid frame assembly comprising, an inner rigid frame members(IRFM)(12), an outer rigid frame members(ORFM)(13), a guide rails(GR)(14), the ergonomic seat support element(ESSE)(4) moves laterally forwardly or backwardly on the guide means and guide rails(GR)(14) of the inner rigid frame member(IRFM)(12), the inner rigid frame member(IRFM)(12) moves laterally leftwardly or rightwardly on the guide means and guide rails(GR)(14) of the outer rigid frame member(ORFM)(13), the inner rigid frame member(IRFM)(12) is co-operable and mounted perpendicularly to the outer rigid frame member(ORFM)(13),

said lateral impact shock absorbing mechanism assembly comprising: a rubber flange(RF)(15), an impact notch(IN)(16), a conical shock absorber(CSA)(17), a vent capillary tubes(VCT)(18), an orifice rim(OR)(19), a rubber flange chamber(RFC)(20) , an inner orbital spring(IOS)(21) , an impact ribbing(IR)(22),

said steering wheel impact retractor mechanism assembly comprising: a pivoted latch(PL)(23), a notch(N)(24) , a life line cable(LLC)(25) , an impact retract spring(IRS)(26),

said impact dissipation mechanism assembly comprising: a non obscurity airbag(NOAB)(27) ,a counter crumple impact bar(CCIB)(28) ,a concussion knee pads(CKP)(29) ,a rotating vertically dash board(RVDB)(30),an outer Lower Leg Guide Pads(OLLGP)(31),

During a front impact on the vehicle then to permit at least the said ergonomic seat support element(ESSE)(4) to move in a yielding and substantially non-resilient manner relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan in a direction forwardly of the ergonomic seat(ES)(2) in a controlled dissipation of shock wave energy by the said impact dissipation mechanism assembly in the general axial direction of impact,

During a rear impact on the vehicle then to permit at least the said ergonomic seat support element(ESSE)(4) to move in a yielding and substantially non-resilient manner relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan in a direction rearwardly of the ergonomic seat(ES)(2) in a controlled dissipation of shock wave energy by the said impact dissipation mechanism assembly in the general axial direction of impact,

During a left impact on the vehicle then to permit at least the said inner rigid frame member(IRFM)(12) to move in a yielding and substantially non-resilient manner relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan in a direction leftwardly of the ergonomic seat(ES)(2) in a controlled dissipation of shock wave energy by the said impact dissipation mechanism assembly in the general axial direction of impact,

During a right impact on the vehicle then to permit at least the said inner rigid frame member(IRFM)(12) to move in a yielding and substantially non-resilient manner relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan in a direction rightwardly of the ergonomic seat(ES)(2) in a controlled dissipation of shock wave energy by the said impact dissipation mechanism assembly in the general axial direction of impact,

In one embodiment the ergonomic seat(ES)(2) is releasably mounted on the ergonomic seat support element(ESSE)(4) by means of the emergency detachment mechanism(EDM)(11), the ergonomic seat support element(ESSE)(4) is mounted on guide means on the inner rigid frame member(IRFM)(12), so that the ergonomic seat support element(ESSE)(4) may slide forwardly or backwardly relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan,the inner rigid frame member(IRFM)(12), is mounted on guide means on the outer rigid frame member(IRFM)(13),so that the inner rigid frame member(IRFM)(12) may slide leftwardly or rightwardly relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan, the outer rigid frame member(ORFM)(13) is fixedly mounted on the vehicle floor pan all lateral movement are controllably damped by said deformation members.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, an embodiment of it will now be described by way of a non-limiting example with reference to the accompanying drawings, in which

Fig. 1 shows Head-rest Support Element(HSE).

Fig. 2 shows Ergonomic Seat(ES).

Fig. 3 shows LISA in a imminent side impact.

Fig. 4 shows LISA shoulder strap extended and retracted.

Fig. 5 shows LISA activated in front impact(A) and rear impact(B).

Fig. 6 shows LISA front , side and plan view.

Fig. 7 shows LISA Shock Absorber Mechanism(ASAM).
before any type of said lateral impact

Fig. 8 shows (ASAM)- Compression Mode(CM).
after said lateral impact

Fig. 9 shows (ASAM)- Break Point Mode(BPM).
during said impact energy dissipation

Fig. 10 shows (ASAM)- Energy Dissipation Mode(EDM).
during said impact energy dissipation

Fig. 11 shows LISA unit before any type of said lateral impact

Fig. 12 shows LISA unit after said lateral impact

Fig.13 shows LISA unit after said lateral impact

Fig. 14 side view of vehicle registered design 2051839
Fig. 15 front view of vehicle registered design 2051839
LISA would be incorporated in such a design 2051839
To improve the understanding of the drawings, like elements which appear

Key label reference to all drawings.

Components of occupant seat assembly comprising,

(1) head-rest support elements(HSE)(1),
(2) ergonomic seat(ES)(2),
(3) seat belt(SB)(3),
(4) ergonomic seat support element(ESSE)(4),
(5) ergonomic seat pivot(ESP)(5),
(6) ergonomic seat angular guide(ESAG)(6),
(7) concussion seat pad(CTP)(7),
(8) base support member(BSM)(8),
(9) opposite shoulder strap(OSS)(9),
(10) base spine restraint(BSR)(10),
(11) emergency detachment mechanism(EDM)(11),

Components of two degrees of freedom frame assembly comprising,

(12) inner rigid frame members(IRFM)(12),
(13) outer rigid frame members(ORFM)(13),
(14) guide rails(GR)(14),

lateral impact shock absorbing mechanism assembly comprising

(15) rubber flange(RF)(15),
(16) impact notch(IN)(16),
(17) conical shock absorber(CSA)(17),
(18) vent capillary tubes(VCT)(18),
(19) orifice rim(OR)(19),
(20) rubber flange chamber(RFC)(20),
(21) inner orbital spring(IOS)(21),
(22) impact ribbing(IR)(22),

steering wheel impact retractor mechanism assembly comprising,

(23) pivoted latch(PL)(23),
(24) notch(N)(24),
(25) life line cable(LLC)(25),
(26) impact retract spring(IRS)(26),

Component of impact dissipation mechanism assembly comprising,

(27) non obscurity airbag(NOAB)(27),
(28) counter crumple impact bar(CCIB)(28),
(29) concussion knee pads(CKP)(29),
(30) rotating vertically dash board(RVDB)(30),
(31) outer Lower Leg Guide Pads(OLLGP)(31),
(32) impact absorbing material
(33) 45 degree Angled vehicle door sill

DESCRIPTION OF PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of lateral impact shock wave absorbing mechanism according to the present invention will be described with reference to the accompanying drawings

HEAD-REST SUPPORT

When you enter the vehicle seat the head-rest support element(HSE)(1) will normally be upwardly positioned as shown in Fig. 1(a) when you start the engine the head-rest support elements(HSE)(1) will fold downwardly to a generally horizontal position as shown in Fig. 1(b) either side of the occupants upper head for side impact protection when you turn the engine off the head-rest support element will rise up as shown in Fig. 1(a),

SEAT BELT & OPPOSITE SHOULDER STRAP

The seat belt(SB)(3) is fixedly mounted, with the inclusion of the auto-recoil function on the outboard upper corner and outboard lower corner of the ergonomic seat(ES)(2) back and releasable attached on the lower inboard side corner of the said ergonomic seat(ES)(2) back, the opposite shoulder strap(OSS)(9) is fixedly mounted, with the inclusion of the auto-recoil on the upper inboard side of said ergonomic seat(ES)(2) back and fixedly mounted in a mid way down on the same side of the seat back as shown in Fig. 2,

FRONT IMPACT GREATER THAN BPT

In the event of a lateral impact force as shown in Fig. 5(A) which is greater than the predetermined break point impact force setting the Lateral Impact Shock Wave Absorber(LISA) will fully activate in the following procedure during a forward impact of sufficient impact force the occupant of the vehicle seat will be thrown in the direction on the initial impact the occupant is accelerated forward but prevented from leaving the seat by the seat belt(SB)(3) and the opposite shoulder strap(OSS)(9) being co-operable with the ergonomic seat(ES)(3) the deceleration of the occupant is as follows the rubber flange(RF)(15) as shown in Fig. 7 will bow outwardly in the mid section thereof due to the initial impact force which in turn will cause the movement of the mass of the occupant strapped into the occupant seat by the seat belt(SB)(3) and opposite shoulder strap(OSS)(9), the ergonomic seat(ES)(3) which is secured releasable or permanently on the ergonomic seat support element(ESSE)(4) as shown in Fig. 5(A) ,will slide towards the direction of the lateral impact force

The end of the rubber flange(RF)(15) adjacent to the ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of the ergonomic seat support element(ESSE)(4) protruding orifice rim(OR)(19) thereof, as shown in Fig. 7

An air tight seal is provided by means of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of the rubber flange(RF)(15) in which the guide means will laterally move, as shown in Fig. 7

While the rubber flange(RF)(15) is bowing outwardly this will cause the rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of the rubber flange chamber(RFC)(20) by means of the guide rails(GR)(14) vent capillary tubes(VCT)(18)thereof,as shown in Fig. 8

If the initial impact force is greater than the break point impact force setting then the rubber flange(RF)(15) plurality of bumps will disengage the impact ribbing(IR)(22) plurality of ribs integral to the conical shock absorber(CSA)(17) the rubber flange(RF)(15) is co-operable to the impact ribbing(IR)(22), end of the rubber flange(RF)(15) adjacent to the impact notch(IN)(16) will snap over the impact notch(IN)(16) by the co-operable arrangement of the guide rails(GR)(14), impact notch(IN)(16) thereof and the rubber flange(RF)(15), as shown in Fig. 9

the rubber flanges(RF)(15), internal orbital spring(IOS)(21) thereof will immediately contract on the opposite side of the impact notch(IN)(16) and block the guide rails(GR)(14), vent capillary tubes(VCT)(18) causing a complete air tight seal and a vacuum within the rubber flange chamber(RFC)(20), as shown in Fig.9

the energy of the initial impact force will continue to be dissipated due to the end of the rubber flange(RF)(15) adjacent to the conical shock absorber(CSA)(17) sliding up the conical shock absorber(CSA)(17) generating a frictional force thereof by the interaction of the inner surface of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof upon the surface of the conical shock absorber(CSA)(17) generating a vacuum within the rubber flange chamber(RFC)(20), as shown in Fig. 10

during the lateral impact the ergonomic seat(ES)(2) being releasable or permanently attached to the ergonomic seat support element(ESSE)(4), the ergonomic seat support element(ESSE)(4) will slide in the direction of the impact compressing the deformation member as described above as shown in Fig. 5(A)

the ergonomic seat(ES)(2) being pivotally attached at the front end by the ergonomic seat pivot(ESP(5) and supported at the rear end by the base support member(BSM)(8) and the outer ergonomic seat angular guide(ESAG)(6), as shown in Fig. 11,

during the motion of sliding forward the ergonomic seat will slide away from the base support member(BSM)(8) ,the ergonomic seat no longer being supported will controllably drop downwardly at the rear by means of the seat angular guide(SAG)(6) ,in order to dissipate the energy of the occupant as the occupant trusts downwardly on to the concussion seat pad(CSP)(7) the base spine restraint(BSR)(10) protrudes upwardly with respect to the rear of the ergonomic seat(ES)(2) as it rotates downwardly about the frontage seat pivot(SP)(5), as shown in Fig. 12,

during the motion of sliding forward the ergonomic seat being permanently or releasably attached to the ergonomic seat support element(ESSE)(4) slide laterally in the direction of the impact , a life line cable(LLC)(25) with an integral outer sheath is fixedly attached upon the rear of the ergonomic seat support element(ESSE)(4) at one end and is fixedly attached to a pivoted latch(PL)(23) which is engaged in to a notch(N)(24) adjacent the steering wheel column, prior to any movement of the life line cable the pivoted latch(PL)(23) will be engaged to the notch(N)(24) which will maintain the tension of the impact retract spring(IRS)(26) in order the maintain the position of the steering wheel in a normally outwardly position, as shown in Fig. 11 and Fig. 12,

during the retracting movement of the life line cable the pivoted latch(PL)(23) will angularly rotate and disengage the notch(N)(24) which will release the tension of the impact retract spring(IRS)(26) in order the retract the position of the steering wheel to an inwardly position sustaining the distance between the steering wheel and the occupant during the forward impact, as shown in Fig. 11 and Fig. 12,

during the motion of sliding forward the ergonomic seat being permanently or releasably attached to the ergonomic seat support element(ESSE)(4) slide laterally in the direction of the impact , the occupants view will not be obscured by a non obscurity airbag(NOAB)(27), a counter crumple impact bar(CCIB)(28) will main the zone in which the occupant in the ergonomic seat will slide maintain the vehicle floor integrity reduce deformation within

predetermined thresholds, as the occupant travels laterally forward during energy dissipation ,the occupants knees may impact the , concussion knee pads(CKP)(29) located around the frontage of the dash board , the rotating vertically dash board(RVDB)(30) will disengage from its normally horizontal position to a vertical position exposing more of the concussion knee pads(CKP)(29) if struck by the knees or any part of the occupant as the occupant travels laterally forward during energy dissipation , the lower leg and knees will be guide to the concussion knee pads(CKP)(29) by means of the outer lower leg guide pads(OLLGP)(31),
as shown in Fig.11 and Fig.12 and Fig.13,

REAR IMPACT GREATER THAN BPT

In the event of a lateral rear impact force as shown in Fig. 5 (B)which is greater than the predetermined break point impact force setting the Lateral Impact Shock Wave Absorber(LISA) will fully activate in the following procedure, during a rear impact of sufficient impact force the occupant of the vehicle seat will be thrown in the direction on the initial impact the occupant is accelerated rearwardly but prevented from leaving the seat by the upper seat back, seat belt(SB)(3) and the opposite shoulder strap(OSS)(9) and are co-operable with the ergonomic seat(ES)(2) as shown in Fig. 1,Fig.2,Fig.4, the deceleration of the occupant is as follows,
the rubber flange(RF)(15) as shown in Fig.8 will bow outwardly in the mid section thereof due to the initial impact force which in turn will cause the movement of the mass of the occupant strapped into the occupant seat by the seat belt(SB)(3) and opposite shoulder strap(OSS)(9) as shown in Fig.2 , the ergonomic seat(ES)(3) which is secured releasable or permanently on the ergonomic seat support element(ESSE)(4) will slide towards the direction of the lateral impact force, as shown in Fig.5(B),
The end of the rubber flange(RF)(15) adjacent to the ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of the ergonomic seat support element(ESSE)(4) protruding orifice rim(OR)(19) thereof, as shown in Fig.6 and in Fig.7,
An air tight seal is provided by means of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of the rubber flange(RF)(15) in which the guide means will laterally move, as shown in Fig. 7 and in Fig. 8
While the rubber flange(RF)(15) is bowing outwardly this will cause the rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of the rubber flange chamber(RFC)(20) by means of the guide rails(GR)(14), vent capillary tubes(VCT)(18) thereof, shown in Fig.8

If the initial impact force is greater than the break point impact force setting then the rubber flange(RF)(15) plurality of bumps will disengage the impact ribbing(IR)(22) plurality of ribs integral to the conical shock absorber(CSA)(17) the rubber flange(RF)(15) is co-operable to the impact ribbing(IR)(22), end of the rubber flange(RF)(15) adjacent to the impact notch(IN)(16) will snap over the impact notch(IN)(16) by the co-operable arrangement of the guide rails(GR)(14), impact notch(IN)(16) thereof and the rubber flange(RF)(15), as shown in Fig. 8, and in Fig 9,
the rubber flanges(RF)(15), internal orbital spring(IOS)(21) thereof will immediately contract on the opposite side of the impact notch(IN)(16) and block the guide rails(GR)(14), vent capillary tubes(VCT)(18) causing a complete air tight seal and a vacuum within the rubber flange chamber(RFC)(20), as shown in Fig. 8,and in Fig 9,
the energy of the initial impact force will continue to be dissipated due to the end of the rubber flange(RF)(15) adjacent to the conical shock absorber(CSA)(17) sliding up the conical shock absorber(CSA)(17) generating a frictional force thereof by the interaction of the inner surface of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof upon the surface of the conical shock absorber(CSA)(17) generating a vacuum within the rubber flange chamber(RFC)(20), as in Fig. 9 and in Fig.10

during the lateral impact the ergonomic seat(ES)(2) being releasable or permanently attached to the ergonomic seat support element(ESSE)(4) , the ergonomic seat support element(ESSE)(4) will slide in the direction of the impact compressing the deformation member as described above as shown in Fig. 5(B)

<u>LEFTWARDLY OR RIGHTWARDLY SIDE IMPACT GREATER THAN Break Point Threshold</u>

In the event of a lateral impact force which is greater than the predetermined break point impact force setting the Lateral Impact Shock Wave Absorber(LISA) will fully activate in the following procedure
during a leftwardly or rightwardly impact as shown in Fig. 3 of sufficient impact force the occupant of the vehicle seat will be thrown in the direction on the initial impact the occupant is accelerated sidewardly but prevented from leaving the seat by the side lumber supports and seat belt(SB)(3) and the opposite shoulder strap(OSS)(9) and are co-operable with the ergonomic seat(ES)(2) the deceleration of the occupant is as follows

The head of the occupant is restricted from a leftwardly or rightwardly whiplash by means of the head-rest support elements(HSE)(1) as shown in Fig.1, Fig.2, Fig.3 and Fig. 4, extending preferably on both side, but at least one side of the occupants head pivotally mounted on the upper sides of the head-rest in order to provide servo positioning form angularly up to the horizontal position with respect to the head-rest or ergonomic seat(ES)(2)

the rubber flange(RF)(15) will bow outwardly in the mid section thereof due to the initial impact force which in turn will cause the movement of the mass of the occupant strapped into the occupant seat by the seat belt(SB)(3) and opposite shoulder strap(OSS)(9) as shown in Fig.3 and Fig.8,
, the ergonomic seat(ES)(3) which is secured releasable or permanently on the ergonomic seat support element(ESSE)(4) will slide towards the direction of the lateral impact force as shown in Fig.3
The end of the rubber flange(RF)(15) adjacent to the ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of the inner rigid frame member(IRFM)(12) protruding orifice rim(OR)(19) thereof as shown in Fig 6 and in Fig.7,
An air tight seal is provided by means of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of the rubber flange(RF)(15) in which the guide means will laterally move as shown in Fig.7 and in Fig.8
While the rubber flange(RF)(15) is bowing outwardly this will cause the rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of the rubber flange chamber(RFC)(20) by means of the guide rails(GR)(14), vent capillary tubes(VCT)(18) thereof, shown in Fig. 8
If the initial impact force is greater than the break point impact force setting then the rubber flange(RF)(15) plurality of bumps will disengage the impact ribbing(IR)(22) plurality of ribs integral to the conical shock absorber(CSA)(17) the rubber flange(RF)(15) is co-operable to the impact ribbing(IR)(22), end of the rubber flange(RF)(15) adjacent to the impact notch(IN)(16) will snap over the impact notch(IN)(16) by the co-operable arrangement of the guide rails(GR)(14), impact notch(IN)(16) thereof and the rubber flange(RF)(15), as shown in Fig.8 and in Fig.9,
the rubber flanges(RF)(15), internal orbital spring(IOS)(21) thereof will immediately contract on the opposite side of the impact notch(IN)(16) and block the guide rails(GR)(14), as shown in Fig.8 and Fig.9,

vent capillary tubes(VCT)(18) causing a complete air tight seal and a vacuum within the rubber flange chamber(RFC)(20), as shown in Fig.9 the energy of the initial impact force will continue to be dissipated due to the end of the rubber flange(RF)(15) adjacent to the conical shock absorber(CSA)(17) sliding up the conical shock absorber(CSA)(17) generating a frictional force thereof by the interaction of the inner surface of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof upon the surface of the conical shock absorber(CSA)(17) generating a vacuum within the rubber flange chamber(RFC)(20), as shown in Fig.9 and Fig.10,

during the lateral impact the ergonomic seat(ES)(2) being releasable or permanently attached to the ergonomic seat support element(ESSE)(4) , the ergonomic seat support element(ESSE)(4) being rail mounted on said inner rigid frame member(IRFM)(12) the said inner rigid frame member (IRFM) (12) being rail mounted on said outer rigid frame member(ORFM)(13) being perpendicular to it as shown in Fig.6 will slide in the direction leftwardly or rightwardly on said outer rigid frame member(ORFM)(13) during the impact compressing the deformation member between said inner rigid frame member (IRFM)(12) and said outer rigid frame member(ORFM)(13) as described above

FRONTWARDLY OR REARWARDLY OR
LEFTWARDLY OR RIGHTWARDLY
IMPACT LESS THAN BREAK POINT THRESHOLD

If the lateral impact force which is less than the predetermined break point impact force setting the Lateral Impact Shock Wave Absorber(LISA) will not fully activate in the following procedure, due to the initial impact force which in turn will cause the movement of the mass of the occupant strapped into the occupant seat by the seat belt(SB)(3) the seat which is secured releasable or permanently on the ergonomic seat support element(ESSE)(4) will slide towards the direction of the lateral impact force,

The end of the rubber flange(RF)(15) adjacent to the ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of the ergonomic seat support element(ESSE)(4) protruding orifice rim(OR)(19) or inner rigid frame member(IRFM)(12) thereof, The end of the rubber flange(RF)(15) adjacent to ergonomic seat support element(ESSE)(4) or inner rigid frame members(IRFM)(12) is secured by the co-operable arrangement of the ergonomic seat support(ESSE)(4) or inner rigid frame member(IRFM)(12) protruding orifice rim(OR)(19) thereof,as in Fig.7

An air tight seal is provided by means of the rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of the rubber flange(RF)(15) in which the guide means will laterally move as shown in Fig. 8,

The rubber flange(RF)(15) will bow outwardly in the mid section thereof While the rubber flange(RF)(15) is bowing outwardly this will cause the rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of the rubber flange chamber(RFC)(20) by means of the guide rail(GR)(14), vent capillary tubes(VCT)(18) thereof, as in Fig. 8,

The movement of air within the rubber flange chamber(RFC)(20) will cause a damping effect and dissipate the initial impact force because the initial impact force is below the break point impact force setting the rubber flange(RF)(15) will not breach the impact notch(IN)(16), and the rubber flange(RF)(15) plurality of bumps will not fully disengage the impact ribbing(IR)(22) plurality of ribs integral to the conical shock absorber(CSA)(17) the rubber flange(RF)(15) is co-operable to the impact ribbing(IR)(22), as shown in Fig. 8,
The rubber flange(RF)(15) will elastically return from the outwardly bowing state to its original state before the initial impact pushing the ergonomic seat support element(ESSE)(4) back to its central neutral position,as shown in Fig. 7 and in Fig. 2,

The co-operable arrangement between the impact notch(IN)(16) and rubber flange(RF)(15) will determine the break point impact force setting,

The inner rigid frame members(IRFM)(12) being adapted to slide, side to side on the outer rigid frame members(ORFM)(13) which is impeded from free movement only in the event of an impact of predetermined lateral force, by the co-operable arrangement of the rubber flange(RF)(15) provided on the inner rigid frame members(IRFM)(12) and the adjacent conical shock absorber(CSA)(17) and frontage impact notch(IN)(16) provided on the outer rigid frame members(ORFM)(13) and guide rails(GR)(14) thereof,

A means for securing the outer rigid frame members(ORFM)(13) on the vehicle floor pan chassis,

LISA which is designed to absorb the initial shock wave and reduce the injuries, for impacts over approximately 50 Km/h, 30 mph

LISA will activate and disengage from its neutral position and slide towards the impact and therefore dissipate the impact shock wave. If there is a side impact or rear impact LISA will activate at a lower impact of approximately 40Km/h

The ergonomic seat support apparatus comprising an inner rigid frame member(IRFM)(12) and perpendicular outer rigid frame member (ORFM)(13) has two degrees of freedom forward, back and side to side and would be free to slide in any lateral direction, but the ergonomic seat support element(ESSE)(4) is held firm in its neutral central position by a set of rubber flanges(RF)(15). The rubber flanges(RF)(15) are impeded from lateral movement along the guide rails(GR)(14) due to the integral impact ribbing impact notch(IN)(16) which is the frontage to the conical shock absorber(CSA)(17) thereof and lateral movement will occur only in the event of an impacts over a predetermined magnitude impact force or impact velocity,

The distance moved up the conical shock absorber(CSA)(17) is related to the magnitude force of impact, the greater the impact the greater the movement up the conical shock absorber(CSA)(17),

Dissipation of the impact force is achieved by the frictional force generated by the co-operable arrangement as the rubber flanges(RF)(15) moves up the conical shock absorber(CSA)(17),

After the impact the ergonomic seat support element(ESSE)(4) will be reset back in to it central neutral position either manually or automatically or by using a hydraulic ram to push the ergonomic seat support element(ESSE)(4) back to the central neutral position,

POSSIBILITY OF EXPLOITATION IN INDUSTRY

A lateral impact shock wave absorbing mechanism according to the present invention applicable for a supporting structure of a vehicle seat such as automobile motor sports ,air craft , sea craft railway vehicle in order to reduce injuries during an initial impact from the front,rear or either side

Claims

1. A lateral impact shock energy absorbing mechanism in a vehicle seat, which protects a person from impacts associated with a lateral vehicle impact front the front ,back or either side ,the occupant seat assembly ,
a two degrees of freedom rigid frame assembly,
a deformation member mechanism assembly ,
a steering wheel impact retractor mechanism assembly ,
an impact dissipation mechanism assembly ,
said occupant seat assembly comprising;

a head-rest support elements (HSE)(1) having at least one generally horizontal pivotally mounted support element adjacent to the upper part of the head-rest and extending forward relative to the head-rest along at least one side of the occupants upper head substantially non obscuring the occupants sideways view, the said head-rest is lateral rotationally about vertical axis and mounted on the ergonomic seat(ES)(2) back such that angular lateral rotation towards a leftwardly or rightward displacement rotating about the said vertical axis towards the inboard or outboard side of the said ergonomic seat(ES)(2) back of the head-rest relative to the said ergonomic seat(ES)(2)back occurs only when a lateral leftwardly or rightwardly impact acting on said ergonomic seat(ES)(2) back exceeds a preselected threshold substantially reducing neck side whiplash,

a ergonomic seat(ES)(2) having at least one generally horizontal segment pivotally mounted on the upper frontage of the at least one ergonomic seat support element(ESSE)(4) by means of at least one ergonomic seat pivot(ESP)(5) fixedly mounted on the upper front of the at least one ergonomic seat support element(ESSE)(4), said ergonomic seat(ES)(2) being supported under the rear end portion thereof by the upper portion of the at least one base support member(BSM)(8) the lower underneath portion is fixedly mounted on the vehicle floor said ergonomic seat(ES)(2) being supported at least one side of the rear thereof by the at least one ergonomic seat angular guide(ESAG)(6) fixedly mounted on the upper rear side portion of the said at least one ergonomic seat support element(ESSE)(4), such that forward displacement of a predetermined forward distance of said ergonomic seat support element(ESSE)(4) relative to said vehicle floor will cause the said ergonomic seat support element(ESSE)(4) to be not supported by the said at least one base support element(BSE)(8) causing the said ergonomic seat support element(ESSE)(4)

at angularly rotate about the said at least one ergonomic seat pivot(ESP)(5) controllably dropping downwardly in a non resilient angular rotation backwardly by means of said at least one ergonomic seat angular guide(ESAG)(6) occurs only when the force of said forward impact acting on said ergonomic seat exceeds a preselected threshold,

a seat belt(SB) fixedly mounted on the upper outboard of said ergonomic seat(ES)(2) back and fixedly mounted on the lower outboard of said ergonomic seat(ES)(2) back and releasably mounted on the lower inboard of said ergonomic seat(ES)(2) back ,

said at least one ergonomic seat support element(ESSE)(4) being substantially underneath the said ergonomic seat(ES)(2),

said at least one ergonomic seat pivot(ESP)(5) being substantially between and towards the frontage of and below said ergonomic seat(ES)(2) and above or below said at least one ergonomic seat support element(ESSE)(4),

said at least one ergonomic seat angular guide(ESAG)(6) adjacent the rear side of the said ergonomic seat(ES)(2),

a concussion seat pad(CSP)(7) is fixedly mounted on the seat area on the top side of the said ergonomic seat(ES)(2),

said base support member(BSM)(8) is fixedly mounted to the vehicle floor the upper portion is supporting and adjacent to the underside of the rear of the said ergonomic seat(ES)(2),

a opposite shoulder strap(OSS)(9) incorporating auto recoil is fixedly mounted on the upper inboard side at one end and fixedly mounted upper midway down at the other end and integral to the inboard side of the said ergonomic seat(ES)(2) back,

a base spine restraint(BSR)(10) is fixedly mounted on the upper frontage of the seat area on the top side of the said ergonomic seat(ES)(2) and between the legs of the occupant,

a emergency detachment mechanism(EDM)(11) is fixedly mounted on the said at least one ergonomic seat support element(ESSE)(4) on order to detach the said at least one ergonomic seat support element(ESSE)(4) from the rigid frame assembly after a said lateral impact in order to make the rescue of the occupant easier,

said rigid frame assembly comprising:
a inner rigid frame member(IRFM)(12),
a outer rigid frame member(ORFM)(13),
a guide rail(GR)(14),
said at least one guide rail(GR)(14) is fixedly mounted between the upper inside front and upper inside rear of the
said inner rigid frame member(IRFM)(12), adjacent to and in the same axial direction to integral guide means thereof
said ergonomic seat support element(ESSE)(4) incorporates at least one guide hole and at least one guide means under the said ergonomic seat support element(ESSE)(4),
said at least one guide hole is circumferentially mounted on the at least one generally horizontal said at least one guide rail(GR)(14)
said inner rigid frame member(IRFM)(12) is generally perpendicular to and lateral guide mounted on the said outer rigid frame member(ORFM)(13), in order to slide laterally in a leftwardly or rightwardly direction on the said outer rigid frame member(ORFM)(13)
said at least one guide rail(GR)(14) is fixedly mounted between the upper inside front and upper inside rear of the
said outer rigid frame member(ORFM)(13), adjacent to and in the same axial direction to integral guide means thereof
said inner rigid frame member(IRFM)(12) incorporates at least one guide hole and at least one guide means under the said inner rigid frame member(IRFM)(12)
said at least one guide hole is circumferentially mounted on the at least one generally horizontal said at least one guide rail(GR)(14),
said lateral impact shock absorbing mechanism assembly comprising:
a rubber flange(RF)(15) circumferently mounted on the end portion of the said at least one guide rail(GR)(14) forming a pneumatic cylinder or rectangular pneumatic cell partial hermetically sealing the orifice circumferently on the outer end of the said rubber flange(RF)(15) adjacent and prior an at least one impact notch(IN)(16) by means of integral at least one internal orbital spring(IOS)(21) fixedly mounted around the end thereof and partial hermetically sealing the orifice circumferently on the inner end portion of the said at least one guide rail(GR)(14) at the other end of the said rubber flange(RF)(15) by means of integral said at least one internal orbital spring(IOS)(21) fixedly mounted around the other end thereof,

said at least one impact notch(IN)(16) circumferently mounted on the outer end portion of the said at least one guide rail(GR)(14) adjacent to and proceeds at least one vent capillary tube(VCT)(18) outlet,

a conical shock absorber(CSA)(17),circumferently mounted on the outer end portion of the said at least one guide rail(GR)(14) adjacent to and follows said at least one vent capillary tube(VCT)(18) outlet,

said vent capillary tubes(VCT)(18) having at least one generally horizontal tube is integral to the end portion of the said at least one guide rail(GR)(14) one end is adjacent a rubber flange chamber(RFC)(20) and proceeds the impact ribbing(IR)(22) , and proceeds said impact notch(IN)(16) the other end is adjacent to said conical shock absorber(CSA)(17) and follows the said impact ribbing(IR)(22) in order to eject air from within the said rubber flange chamber(RFC)(20) to the outside only when the force of said impact acting on said ergonomic seat(ES)(2) exceeds a preselected threshold which in turn will compress the said rubber flange(RF)(15),

a orifice rim(OR)(19) is an integral part of laterally moving body such as the ergonomic seat support element(ESSE)(4) at least one guide hole in a generally forwardly or backwardly displacement with respect to the inner rigid frame member(IRFM)(12) and vehicle floor or
an integral part of laterally moving body such as the inner rigid frame member(IRFM)(12)at least one guide hole in a generally leftwardly or rightwardly with respect to the outer rigid frame member(ORFM)(13) and vehicle floor in both above cases the said orifice rim(OR)(19) is a frontage to the at least one guide hole in both above cases and forms a fixedly co-operable mounting arrangement between the outer end of the said at least one rubber flange(RF)(15) and inner frontage to the at least one guide hole in order to reduce the possibility of the rubber flange(RF)(15) from slipping out of the said orifice rim(OR)(19) in both above cases,

said rubber flange chamber(RFC)(20) is an integral part of the said rubber flange(RF)(15) adjacent to the said at least one guide rail(GR)(14) and adjacent to the said at least one end of vent capillary tube(VCT)(18) and between one end of said at least one rubber flange(RF)(15) and said impact ribbing(IR)(22),

said inner orbital spring(IOS)(21) is integral and circumferently mounted in the orifice of both end portion of the said at least one rubber flange(RF)(15),

said plurality of bumps forming an impact ribbing(IR)(22) is integral to the end portion of the said at least one guide rail(GR)(14) prior and adjacent to the said at least one impact notch(IN)(16)
said a steering wheel impact retractor mechanism assembly comprising:

at least one pivoted latch(PL)(23) adjacent the steering wheel column said at least one pivoted latch(PL)(23) is rotate ably held in a angular generally downward position adjacent the said steering wheel column by means of an integral spring such that the said pivoted latch(PL)(23) will engage a notch(N)(24) integral to the steering wheel column

said at least one notch(N)(24) is adjacent and co-operable with the said at least one pivoted latch(PL)(23) and integral to the said steering wheel column,

at least one life line cable(LLC)(25) one end is pivotally mounted on the upper side of the said at least one pivoted latch(PL)(23) in order to angularly retract the said at least one pivoted latch form a generally downward position to a generally upwardly position in order to disengage the said at least one notch(N)(24) integral to the steering wheel column , the other end of said at least one life line cable(LLC)(25) is fixedly mounted on the rear of said ergonomic seat support element(ESSE)(4) only when the force of said front impact with respect to the ergonomic seat exceeds a preselected threshold the forward lateral movement of said ergonomic seat will cause the forward movement of the said ergonomic seat support element(ESSE)(4) and the compression of said lateral impact shock absorbing mechanism the said at least one life line cable(LLC)(25) being fixedly attached to the said ergonomic seat support element(ESSE)(4) will retract the said at least one life line cable(LLC)(25) which will retract the said at least one pivoted latch(PL)(23)in order to angularly retract the said at least one pivoted latch form a generally downward position to a generally upwardly position in order to disengage the said at least one notch(N)(24) integral to the steering wheel column,

a impact retract spring(IRS)(26) is integral to the said steering wheel column and adjacent to the steering wheel , after the said at least one pivoted latch(PL)(23) is angularly retracted after the said front impact the said at least one pivoted latch will retract form a generally downward position to a generally upwardly position in order to disengage the said at least one notch(N)(24) integral to the steering wheel column the said impact retract spring(IRS)(26) being fixedly mounted to the steering wheel column at one end and fixedly mounted to the steering wheel and in a tension will inwardly retract the said steering wheel maintaining the distance between the forwardly moving occupant and the backwardly inwardly moving steering wheel,

said an impact dissipation mechanism assembly comprising:

a non obscurity airbag(NOAB)(27) is integral to the steering wheel wherein said non obscurity airbag(NOAB)(27) is of an clear see through material and formed in such a way as not to obscure the view of the occupant,

a counter crumple impact bar(CCIB)(28) adjacent to behind the rotating vertically dash board(RVDB)(30) extending around the frontage of the occupant zone and integral to the side doors in order to sustain the integrity of the frontage of the occupant zone and reduce vehicle floor deformation,

at least one concussion knee pads(CKP)(29) adjacent to the underside of the said rotating vertically dash board(RVDB)(30),

said rotating vertically dash board(RVDB)(30) adjacent to above and behind said steering column such that rotating vertical displacement of said rotating vertically dash board(RVDB)(30) occurs only when the force of said impact from any part of the occupants body such as the knees striking the said rotating vertically dash board(RVDB)(30) exceeds a preselected threshold,

a outer lower leg guide pad(OLLGP)(31) adjacent to both outer sides the occupants leg such that any forward lateral movement of the occupant during a forward impact will guide the occupants legs to the at least one concussion knee(CKP)(29).

2. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein means to protect the neck and upper head sideways twisting movement after a said side impact is provided by said head-rest support element(HSE)(1).

3. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 or Claim 2, wherein means to support the side of the occupants head extending along one or both sides of the occupants upper head although not to block the sideways view is provided with at least one head-rest support element(HSE)(1).

4. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 2 or Claim 3, wherein the head-rest is provided with at least one head-rest support element(HSE)(1).

5. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 3 or Claim 4, wherein lateral rotation means is provided by the head-rest with said least one head-rest support element(HSE)(1) in a leftwardly or rightwardly rotation about said vertical axis towards the in board or outboard side with respect to the said ergonomic seat.

6. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 4 or Claim 5, wherein lateral rotation means is provided by the head-rest with said least one head-rest support element(HSE)(1) is designed to move in a yielding controlled damping lateral rotation towards the generally leftwardly or rightwardly impact by the movement of the occupants head occurs only when the force of said impact acting on said ergonomic seat exceeds a preselected threshold.

7. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein said ergonomic seat(ES)(2) pivotally mounted on the upper frontage of said ergonomic seat support element(ESSE)(4) by means of as least one ergonomic seat pivot(ESP)(5) fixedly mounted on the upper front or below the said at least one ergonomic seat support element(ESSE)(4).

8. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein occupant restraining means is provided by said seat belt(SB)(3) and said opposite shoulder strap(OSS)(9) fixedly mounted on the said ergonomic seat(ES)(2).

9. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 8 wherein said seat belt(SB)(3) is fixedly mounted on the upper outboard of said ergonomic seat(ES)(2) back and releasably mounted lower inboard of said ergonomic seat(ES)(2) back in order to arrest the forward movement said occupant during said lateral impact.

10. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 8 wherein said opposite shoulder strap(OSS)(9) is fixedly mounted on the upper inboard side of said ergonomic seat(ES)(2) back at one end and fixedly mounted upper midway down at the other end and integral to the inboard side of said ergonomic seat(ES)(2) back in order to arrest the forward movement said occupant during said lateral impact.

11. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 8 wherein said seat belt(SB)(3) and/or opposite shoulder strap(OSS)(9) both incorporate an automatic recoil function such that the occupant may pull the said seat belt(SB)(3) or opposite shoulder strap(OSS)(9) and mechanical means are provided for automatically retracting the said seat belt(SB)(3) and/or opposite shoulder strap about the occupant in the said ergonomic seat(ES)(2) and/or about the said ergonomic seat(ES)(2).

12. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein means for supporting the underneath of the rear end portion of the said ergonomic seat(ES)(2) in a upright normally horizontal orientation prior to said forward impact is provided by said at least one ergonomic seat support element(ESSE)(4) at upper frontage end and fixedly mounted to the said vehicle floor at the other end.

13. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the pivotal means is provided by said at least one ergonomic seat pivot(ESP)(5) linking the said ergonomic seat(ES)(2) and said at least one ergonomic seat support element(ESSE)(4) in co-operation with said at least one ergonomic seat angular guide(ESAG)(6).

14. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the shock energy of the downwardly thrust of the said occupant is absorbed by said concussion seat pad(CSP) fixedly mounted on the seat area of said ergonomic seat(ES)(2).

15. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the restraint means is provided by a base spine restraint(BSR)(10) fixedly mounted at the upper frontage of the said ergonomic seat(ES)(2) located between the legs and adjacent the crotch of the occupant on order that the occupant will not slide out of the said ergonomic seat(ES)(2) during a said forward impact.

16. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein a quick release or detachment means is provided by said emergency detachment mechanism(EDM)(11) adjacent the rear of the ergonomic seat support element(ESSE)(4) in order to rescue the occupant after said impact.

17. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the means for releasably securing said ergonomic seat(ES)(2) on said at least one ergonomic seat support element(ESSE)(4) is provided by the emergency detachment mechanism (EDM)(11) said ergonomic seat support element(ESSE)(4) being adapted to slide forwardly and backwardly upon said at least one inner rigid frame members(IRFM)(12) said ergonomic seat support element(ESSE)(4) being impeded from free lateral movement by the adjacent said lateral impact shock absorbing mechanism assembly adjacent to the said inner rigid frame members(IRFM)(12),either side and towards the lower frontage of said ergonomic seat(ES)(2) is pivotally attached to the either side and towards the upper frontage of said at least one ergonomic seat support element(ESSE)(4) by means of said at least one ergonomic seat pivot(ESP)(5) linkage which operate in co-operation with the said at least one seat angular guide(SAG)(6) mounted either side and towards the lower rear of the said at least one ergonomic seat(2) and the said at least one base support member(BSM)(8),

18. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein means for supporting the ergonomic seat(ES)(2) upright is provided by the said at least one base support member(BSM)(8) while the ergonomic seat(ES)(2) is in the neutral central position prior to said forward impact.

19. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the means for angularly dropping the said ergonomic seat(ES)(2) downwardly is provided by the co-operation of the said at least one ergonomic seat support element(ESSE)(2) the said at least one ergonomic seat pivot(ESP)(5) the said at least one seat angular guide(SAG)(6) and the said lateral impact shock absorbing mechanism assembly the angularly dropping mechanism is dependant upon the initial shock wave and the movement of the said occupant moving against the said seat belt(SB)(3) and additional said opposite shoulder strap(OSS)(9) mounted on the said ergonomic seat(ES)(2).

20. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the means for arresting the movement of the occupant from sliding under the said seat belt(SB)(3) and sliding off the front of the said ergonomic seat(ES)(2) is provided by the said opposite shoulder strap(OSS)(9) and the said base spine restraint(BSR)(10) mounted on the front seat area on the said ergonomic seat(ES)(2) which would be located between the crotch of said occupant.

21. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein the said two degrees of freedom rigid frame assembly comprising:

said at least one inner rigid frame members(IRFM)(12),

said at least one outer rigid frame members(ORFM)(13),

said at least one guide rails(GR)(14) the said at least one ergonomic seat support element(ESSE)(4) moves laterally forwardly or backwardly on the said guide means and said guide rails(GR)(14) of the said at least one inner rigid frame member(IRFM)(12) the said at least one inner rigid frame member(IRFM)(12) moves laterally leftwardly or rightwardly on the said guide means and said at least one guide rails(GR)(14) of the said at least one outer rigid frame member(ORFM)(13)the said at least one inner rigid frame member(IRFM)(12) is co-operable and mounted perpendicularly to the said at least one outer rigid frame member(ORFM)(13).

22. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein during a front impact on the vehicle then to permit at least the said at least ergonomic seat support element(ESSE)(4) to move in a yielding and substantially non-resilient manner relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan in a direction forwardly of the said ergonomic seat compressing the said deformation member between the said at least one ergonomic seat support element(ESSE)(4) and said inner rigid frame member(IRFM)(12).

23. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein during a rear impact on the vehicle then to permit at least the said ergonomic seat support element(ESSE)(4) to move in a yielding and substantially non-resilient manner relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan in a direction rearwardly of the said ergonomic seat compressing the said deformation member between the said at least one ergonomic seat support element(ESSE)(4) and said inner rigid frame member(IRFM)(12).

24. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein during a left impact on the vehicle then to permit at least the said inner rigid frame member(IRFM)(12) to move in a yielding and substantially non-resilient manner relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan in a direction leftwardly of the said ergonomic seat compressing the said deformation member between the said at least one inner rigid frame member(IRFM)(12) and said outer rigid frame member(ORFM)(13).

25. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 wherein during a right impact on the vehicle then to permit at least the said inner rigid frame member(IRFM)(12) to move in a yielding and substantially non-resilient manner relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan in a direction rightwardly of the said ergonomic seat compressing the said deformation member between the said at least one inner rigid frame member(IRFM)(12) and said outer rigid frame member(ORFM)(13).

26. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein the ergonomic seat support element(ESSE)(4) is mounted on guide means on the inner rigid frame member(IRFM)(12) so that the ergonomic seat support element(ESSE)(4) may slide forwardly or backwardly relative to the inner rigid frame member(IRFM)(12) or vehicle floor pan the inner rigid frame member(IRFM)(12) is mounted on guide means on the outer rigid frame member(IRFM)(13) so that the inner rigid frame member(IRFM)(12) may slide leftwardly or rightwardly relative to the outer rigid frame member(ORFM)(13) or vehicle floor pan,

27. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein guide means are provided on the said ergonomic seat support element(ESSE)(4) co-operable with the said inner rigid frame member(IRFM)(12).

28. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein guide rails(GR)(14) is axially slid within the guide hole of the said ergonomic seat support element(ESSE)(4) according to the sliding action of the said ergonomic seat support element.

29. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein the said ergonomic seat support element slide on the guide means of the said inner rigid frame in a generally forwardly or generally backwardly lateral direction.

30. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein guide means are provided on the said inner rigid frame member(IRFM)(12),co-operable with the said outer rigid frame member(ORFM)(13).

31. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein guide rails(GR)(14) is axially slid within guide hole of the said inner rigid frame member(IRFM)(12) according to the sliding action of the said inner rigid frame member(IRFM)(12).

32. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein the said inner rigid frame member(IRFM)(12) slide on the guide means of the said outer rigid frame member(ORFM)(13) in a generally leftwardly or rightwardly lateral direction.

33. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein

an outer rigid frame member (ORFM)(13);

a mounting structure associated with a vehicle floor; and

a plurality of bolts driven through the mounting structure which connect the mounting structure to the outer rigid frame member(ORFM); and adapted to reduce vehicle floor deformation when the impact acting on the vehicle floor is within a preselected level.

34. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein means for absorbing said side impacts by filling the inner core of said vehicle door with an impact absorbent material.

35. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein means for reducing the intrusion of the vehicle door during a said side impact is provided by an angled door sill and co-operable angled door edge sloping generally inwardly upwardly.

36. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1, wherein means for actuating the said at least one head-rest support element(HRS)(1) rotate ably about a pivot from a normally upwardly orientation to a generally horizontal orientation after engine ignition or manually switching means is provided by integral servo means

37. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 36, wherein means for actuating the said at least one head-rest support element(HRS)(1) rotate ably about a pivot from a generally horizontal orientation to a normally upwardly orientation after engine is turned off or manually switching means is provided by integral servo means

38. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 36 or Claim 37, wherein means for incorporating a microphone and speakers is provided on and integral to the said at least one head-rest support element(HRS)(1)

39. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 , wherein means for extending the lower portion of said at least one opposite shoulder strap(OSS)(9) forwardly relative to the said ergonomic seat(ES)(2) back for ease of access prior engine ignition or manually switching means is provided by integral servo means

40. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 or Claim 39, wherein means for retracting the lower portion of said at least one opposite shoulder strap(OSS)(9) backwardly relative to the said ergonomic seat(ES)(2) after engine is turned on or manually switching means is provided by integral servo means

41. A lateral impact shock energy absorbing mechanism in a vehicle seat according to Claim 1 , 39, 40 , wherein means for extending the lower portion of said at least one opposite shoulder strap(OSS)(9) forwardly relative to the said ergonomic seat(ES)(2) back for ease of exit after engine is switched off or manually switching means is provided by integral servo means

42. A lateral impact shock energy absorbing mechanism in a vehicle seat, which protects a person from impacts associated with a lateral vehicle impact front the front ,back or either side according to Claim 1 to 21 or 22 to 25 wherein means for controllably absorbing said shock energy greater than a preselected threshold is provided by

said at least one deformation member comprising:

said end of the rubber flange(RF)(15) adjacent to said at least one ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of said at least one ergonomic seat support element(ESSE)(4) protruding orifice rim(OR)(19) thereof ,an air tight seal is provided by means of said at least one rubber flange(RF)(15) and internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of the rubber flange(RF)(15) in which the guide means will laterally move

said at least one rubber flange(RF)(15) is bowing outwardly this will cause the said rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of said rubber flange chamber(RFC)(20) by means of at least one guide rails(GR)(14) vent capillary tubes(VCT)(18)thereof,

said at least one rubber flange(RF)(15) plurality of bumps will disengage the impact ribbing(IR)(22) plurality of ribs integral to
said at least one conical shock absorber(CSA)(17)
said at least one rubber flange(RF)(15) is co-operable to
said at least one impact ribbing(IR)(22),
end of said at least one rubber flange(RF)(15) adjacent to
said at least one impact notch(IN)(16) will snap over
said at least one impact notch(IN)(16) by the co-operable arrangement of said at least one guide rails(GR)(14),
said at least one impact notch(IN)(16) thereof and
said at least one rubber flange(RF)(15),
said at least one rubber flanges(RF)(15),
said at least one internal orbital spring(IOS)(21) thereof will immediately contract on the opposite side of
said at least one impact notch(IN)(16) and block said at least one guide rails(GR)(14) said at least one vent capillary tubes(VCT)(18) thereof causing a complete air tight seal and a vacuum within said at least one rubber flange chamber(RFC)(20),
the energy of the initial impact force will continue to be dissipated due to the end of said at least one rubber flange(RF)(15) adjacent to
said at least one conical shock absorber(CSA)(17) sliding up the
said at least one conical shock absorber(CSA)(17) generating a frictional force thereof by the interaction of the inner surface of said at least one rubber flange(RF)(15) and said at least one internal orbital spring(IOS)(21) thereof upon the surface of said at least one conical shock absorber(CSA)(17) generating a vacuum within said at least one rubber flange chamber(RFC)(20).

43. A lateral impact shock energy absorbing mechanism in a vehicle seat, which protects a person from impacts associated with a lateral vehicle impact front the front ,back or either side according to
Claim 1 to 21 or 22 to 25 wherein means for controllably absorbing said shock energy less than a preselected threshold is provided by
said at least one deformation member comprising:
said at least one rubber flange(RF)(15) adjacent to
said at least one ergonomic seat support element(ESSE)(4) is secured by the co-operable arrangement of said at least one ergonomic seat support element(ESSE)(4) protruding said at least one orifice rim(OR)(19)

or said at least one inner rigid frame member(IRFM)(12) thereof,

said at least one rubber flange(RF)(15) adjacent to said at least one ergonomic seat support element(ESSE)(4) or said at least one inner rigid frame members(IRFM)(12) is secured by the co-operable arrangement of said at least one ergonomic seat support(ESSE)(4) or said at least one inner rigid frame member(IRFM)(12) protruding orifice rim(OR)(19),

an air tight seal is provided by means of said at least one rubber flange(RF)(15) and said at least one internal orbital spring(IOS)(21) thereof which provides a contracting orifice at both ends of said at least one rubber flange(RF)(15) in which the said guide means will laterally move

said at least one rubber flange(RF)(15) will bow outwardly in the mid section thereof While the said at least one rubber flange(RF)(15) is bowing outwardly this will cause the rubber flange chamber(RFC)(20) thereof to reduce in volume and force the air to be ejected out of the said at least one rubber flange chamber(RFC)(20) by means of the said guide rail(GR)(14), vent capillary tubes(VCT)(18) thereof,

the movement of air within the said at least one rubber flange chamber(RFC)(20) will cause a damping effect and dissipate the said initial impact force because the said initial impact force is below the break point impact force setting the said at least one rubber flange(RF)(15) will not breach the said at least one impact notch(IN)(16), and the said at least one rubber flange(RF)(15) plurality of bumps will not fully disengage the said at least one impact ribbing(IR)(22) plurality of ribs integral to the said at least one conical shock absorber(CSA)(17) the said at least one rubber flange(RF)(15) is co-operable to the said at least one impact ribbing(IR)(22),

the said at least one rubber flange(RF)(15) will elastically return from the said outwardly bowing state to its original state before the said initial impact pushing the at least one ergonomic seat support element(ESSE)(4) back to its central neutral position,

the co-operable arrangement between the said at least one impact notch(IN)(16) and said at least one rubber flange(RF)(15) will determine the break point impact force setting,

the said at least one inner rigid frame members(IRFM)(12) being adapted to slide, side to side on the said at least one outer rigid frame members(ORFM)(13) which is impeded from free movement only in the event of a said impact of predetermined lateral force, by the co-operable arrangement of the said at least one rubber flange(RF)(15) provided on the

said at least one inner rigid frame members(IRFM)(12) and the adjacent the said at least one conical shock absorber(CSA)(17) and frontage

said at least one impact notch(IN)(16) provided on the at least one outer rigid frame members(ORFM)(13) and said guide rails(GR)(14) thereof,a means for securing the outer rigid frame members(ORFM)(13) on the vehicle floor pan chassis,

44. A lateral impact shock energy absorbing mechanism in a vehicle seat, which protects a person from impacts associated with a lateral vehicle impact front the front ,back or either side according to Claim 1 to 21 or 22 to 25 wherein

said lateral impact shock energy absorbing mechanism in a vehicle seat, is designed to absorb the initial shock wave and reduce the injuries, for impacts over approximately 50 Km/h, 30 mph

lateral impact shock energy absorbing mechanism in a vehicle seat, will activate and disengage from its neutral position and slide towards the impact and therefore dissipate the impact shock wave, if there is a side impact or rear impact LISA will activate at a lower impact of approximately 40Km/h

said ergonomic seat support apparatus comprising of at least one inner rigid frame member(IRFM)(12) and perpendicular said atleast one outer rigid frame member (ORFM)(13) has two degrees of freedom forward, back and side to side and would be free to slide in any lateral direction, but the said at least one ergonomic seat support element(ESSE)(4) is held firm in its neutral central position by a set of at least one rubber flanges(RF)(15), the said at least one rubber flanges(RF)(15) are impeded from lateral movement along the said at least one guide rails(GR)(14) due to the integral said at least one impact ribbing and said at least one impact notch(IN)(16) which is the frontage to the said at least one conical shock absorber(CSA)(17) thereof and lateral movement will occur only in the event of an impacts over a predetermined magnitude said impact force or said impact velocity, the distance moved up the said at least one conical shock absorber(CSA)(17) is related to the said magnitude force of impact, the greater the said impact the greater the movement up the at least one conical shock absorber(CSA)(17),

means for dissipation of the said impact force is provided by the frictional force generated by the co-operable arrangement as the at least one rubber flanges(RF)(15) moves up the said at least one conical shock absorber(CSA)(17),

means for resetting after the said impact of the said at least one ergonomic seat support element(ESSE)(4) will be reset back in to it central neutral position is provided by either manually or automatically or by using a hydraulic ram to push the at least one ergonomic seat support element(ESSE)(4) back to the central neutral position,

45. A lateral impact shock energy absorbing mechanism in a vehicle seat substantially as described herein with reference to Fig 1-13 of the accompanying drawing.

The Patent Office

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Application No: GB 9608693.9 **Examiner:** John Twin
Claims searched: 1 **Date of search:** 28 June 1996

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B7B (BSB)

Int Cl (Ed.6): B60N 2/42

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	WO 86/03130 A1	(Werjefelt) - note the transparent air-bag (30)	
A	US 5167421	(Yunzhao)	
A	US 4703827	(Audi)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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